University of Alberta

The Effect of Improved Parent-Infant Interaction on Infant Development: Pilot Study

by

Nicole Lyn Letourneau ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial
fulfilment of the requirements for the degree Doctor of Philosophy

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "The Effect of Improved Parent-Infant Interaction on Infant Development: Pilot Study" by Nicole Lyn Letourneau in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

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Abstract

Adolescents mothers, due to the combined stresses of adolescence and parenting, are prone to be less sensitive and responsive to their infants than older mothers. This often places the children of adolescents at risk. We pilot tested an intervention to improve quality of interactions between adolescent mothers and their infants. Interventions of this type may assure long-term health and well-being of children. Cognitive and social skill development were the major outcomes assessed. Both are aspects of resiliency believed to be affected by the quality of early parent-infant interaction. Subjects were recruited and randomly assigned to either the intervention or control group. The intervention group received a program to improve adolescent mother-infant interaction quality and the control group received neutral information. Both groups were visited six times during which the intervention or neutral information was provided. Outcomes were measured when infants reached 7-9 weeks and 11-13 weeks of age. The Nursing Child Assessment Satellite Training Feeding (NCAFS) and Teaching Scales (NCATS) were used to assess quality of parent-infant interaction and contingent responsiveness between mothers and infants. Infants' cognitive development was assessed by the Bayley Scales of Infant Development II Mental Development Index (MDI) and by the Visual Expectation Paradigm (VEXP).

The dissertation findings are presented in five manuscripts. One manuscript presents the main findings of the intervention. The intervention group, in contrast to the control group, had improved parent-infant interactions and were more contingently responsive. As well, the intervention infants had improved cognitive development. Consistency in the pattern of results suggests promise. Modifications in the VEXP technique

were recommended.

The data provide ample evidence of the feasibility of conducting a larger trial. The other manuscripts address four issues: (1) review of the literature on a clinical model of parent-infant interaction intervention; (2) the description of the development of a clinical nursing intervention into a research protocol; (3) an assessment of factors associated with attrition of adolescent mothers and suggestion of measures to prevent attrition; and (4) implications of the research for the diverse audience of Canadian nurses. The dissertation concludes with a section on recommendations for the conduct of a larger study.

The Chosen

If I could have chosen
I would never choose to suffer
to be poked, prodded, and given distant glares
I would never choose a hard
cold bed for an existence.

I would choose instead
my mother's warmth
her arms and heavy lidded
sighs and smiles of love.

But I had no choice
I was chosen to bear this life
to strive, to struggle, and
to overcome.

Dedication

To Dean and Max.

Acknowledgement

Behind every student is a wonderful company of supporters who make the achievement of the student's goals possible. I would first like to acknowledge the financial support for this research that I received from the Alberta Association for Registered Nurses. In addition, this work could not have been completed without the financial support of the Alberta Heritage Foundation for Medical Research, the National Health Research and Development Program, the University of Alberta, the Canadian Nurses Foundation and Hospital for Sick Children's Foundation, and the New Brunswick Nurses Foundation. The assistance of the Perinatal Research Centre, and particularly Dr. David Olson and Diane Schemick also helped with the smooth completion of this study. Thanks also to Dr. Lyle McGonigle for his valuable assistance.

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INTRODUCTION

The topic of my dissertation research is parent-infant interaction. I have presented the findings using the *mixed paper format* option accepted by the Faculty of Graduate Studies and Research of the University of Alberta. This format consists of a series of published and yet-to-be published manuscripts describing my research. The manuscripts are preceded by this introductory section (consisting of an overview of the manuscripts) and followed by a general discussion and conclusion chapter.

Background to the Research

The quality of the early nurturant caregiving environment frequently has been related to children's later success and development (see for example, Barnard, 1993; Garmezy, 1991; Mangham, McGrath, Reid & Stewart, 1994a & 1994b; Poulsen, 1993; Werner & Smith, 1992). In particular, the quality of parent-infant interaction often has been cited as a protective factor in the promotion of resilience (Barnard, 1997; Easterbrooks, Davidson, & Chazan, 1993; Mangham et al., 1994b; Rutter, 1990). This provided the foundation for my decision to study parent-infant interaction as a protective factor for promoting resilience in children.

Although much has been written about parent-infant interaction in the nursing literature (see for example, Barnard et al., 1989, Sumner & Spietz, 1995a & 1995b), little work has been done to test comprehensive nursing interventions aimed explicitly and only at improving the quality of parent-infant interactions in families at risk. Researchers who have assessed the quality of parent-infant interaction following an intervention were unable to distinguish the unique contribution of various aspects of the intervention program (see for example, the Hawaii Healthy Start Program or the Prenatal Early Infancy Project referred to in Steinhauer, 1997). As well, little research has been done on adolescent parents although they are a group particularly at-risk for less-than-optimal parent-infant interactions (Barnard, 1997; Ruff, 1987; vonWindeguth & Urbano, 1989). Their children stand to gain significantly if the quality of parent-child interactions can be improved (Maynard, 1997). This reasoning led me to study the effects of a nursing intervention program designed to improve the quality of interaction between adolescent mothers and their infants. The theoretical underpinnings of work in this area is resiliency theory.

Objectives

Objective 1: To examine the outcomes of the intervention program with respect to the dependent variables of parent-infant interaction quality, contingent responsiveness of the mothers and infants to one another, and infant cognitive development. The feasibility of conducting a larger trial was assessed with appropriate statistical methods chosen to examine trends in the pilot data.

Objective 2: To test the feasibility of conducting a technique for measuring expectations as an aspect of infant cognitive development. It was necessary to adapt the Visual Expectations Paradigm (VEXP) technique due to the expense of the conventional technique. This was a major reason for conducting a pilot.

Objective 3: To develop, test, and adapt a research protocol manual for the implementation of the intervention program. The intervention program, Keys to Caregiving, is a commercially available teaching package that I adapted for home visitation of the adolescent mothers and their infants.

Objective 4: To assess the feasibility of conducting the study with the population of adolescent mothers and their infants. Retention strategies were implemented and assessed and attrition was evaluated in an effort to design further strategies to reduce attrition. This evaluation will also enable the projection of an appropriate sample size for the study to follow from this feasibility study.

Summary of Methods

This dissertation research was formulated as a feasibility study. A mixed model 2x2 factorial design was employed in this study. The between groups variable was the *Treatment*: Intervention, Control. The within groups variable was *Age* represented by the two post-test measures (occurring when the infants were 7 to 9 weeks and 11 to 13 weeks of age). Twenty-four adolescent mothers were enrolled in the study shortly after giving birth. They were randomly assigned to either the intervention group (n=13) or control group (n=11).

The intervention program tested was Keys to Caregiving, a commercially available teaching package that provides valuable information for new parents on topics such as understanding and responding to infant states, infant behaviour, and infant cues (NCAST, 1990). I adapted the program so that a nurse covered one topic per week for five weekly home visits, followed by a home visit during the sixth week for review. The program was completed by the time the infants were six weeks of age.

The information covered in Keys to Caregiving is designed to promote parents' *capacities* to interact with infants in order to enhance childhood resiliency to stress. It does not contain information about *deficits* (such as postpartum depression or child discipline) or prevention of deficits. Only topics that are part of the Keys to Caregiving package were included as part of the intervention in this study.

Both social skill and cognitive development are important aspects of resiliency and they are believed to be affected by the quality of early parent-infant interaction. As a result, I chose parent-infant interaction and contingent responsiveness as dependent variables since they enabled me to assess the efficacy of the intervention and provided an early measure of infant social skill development. This is part of what makes this research innovative.

A general measure of infant cognition was obtained with the Bayley Scales of Infant Development II Mental Development Index (MDI) (Bayley, 1993), and a more specific measure was obtained with the Visual Expectation Paradigm Test (VEXP) (Haith, 1993), at 11 to 13 weeks of infant age. The specific measure focused on the formation of infant expectations by examining visual reaction time and visual anticipation, both believed to indicate the speed of information-processing and the formation of rule-based expectations in infants (Jacobson et al., 1992). All of these processes are believed to be affected by the degree of contingent responsiveness of the infants' parenting environment. Haith and colleagues (1993) assert that the development and use of expectations captures an important facet of intelligence. Preliminary work indicates that the ability of infants to form expectations may be related to cognitive ability in infants (Jacobson et al., 1992), preschoolers (DiLalla et al., 1990; Dougherty & Haith, 1997), and adults (Benson, Cherny, Haith & Fulker, 1993; DiLalla et al., 1990).

The examination of the relationship between contingently responsive parent-infant interactions and the development of expectations as an aspect of infant cognition is also part of what makes this research innovative.

Another aspect of this dissertation research is the replication of work summarized in Sumner and Spietz (1995a, 1995b). The Nursing Child Assessment Feeding and (NCAFS) Teaching (NCATS) Scales were administered at 7 to 9 weeks and 11 to 13 weeks of infant age, to assess social skill development (Sumner & Spietz, 1995a, 1995b). The examination of effects between 7 to 9 weeks and 11 to 13 weeks of age tests Barnard's (1995) contention that the establishment of positive gains in parent-infant interactions are likely to be reinforced over time.

Primary Hypotheses

The primary hypotheses of the study were that:

- adolescent parents and their infants who receive the Keys to Caregiving intervention will have higher NCAFS and NCATS scores than those who do not receive the intervention (group main effect)
- infants in the intervention group will have higher cognitive development quotient scores on the MDI and faster VEXP reaction times than those infants who do not receive the intervention (group main effect)
- the control group NCAFS, NCATS will not change between age 7-9 weeks and 11-13 weeks whereas the scores of the intervention group will be significantly higher at age 11-13 weeks (interaction of group and age)

The research methods are described in detail in the second manuscript, pages 46 to 56 of this dissertation. The model of the study is depicted in Figure 1-1.

Figure 1-1. Study model.

Intervention		*Dependent Variables*		*Outcomes*
Knowledge and practice		Social skill--Parent-infant interaction		Competent social skills
of high-quality	→	Social skill--Contingent responsiveness	→	Improved cognitive ability
parent-infant interaction		Infant cognition--Expectations		(Two aspects of resiliency)
		Infant cognition--General		

Manuscripts

Each of the four objectives was achieved and the results are presented in the manuscripts that follow. As this is a mixed paper-format dissertation, each chapter (excluding this introductory and final chapter) is a manuscript appropriate for publication. Since nursing is an applied (or practice) discipline, the manuscript styles vary to meet the needs of both nurse researchers and nurse practitioners.

- The first manuscript is a review article.
- The second manuscript presents the findings of the intervention study for researchers.
- The third manuscript addresses the stages associated with developing the research protocol from the commercially available Keys to Caregiving intervention program.
- The fourth manuscript contains a brief report about factors that contribute to attrition in research with this population and suggestions for preventing attrition.
- The final manuscript presents clinical implications for the widely diverse audience of Canadian nurses.

Manuscript One

The first manuscript has been published:

Letourneau, N. (1997). Fostering resiliency in infants and young children through parent-infant interaction. *Infants and Young Children, 9* (3), 36-45.

The purpose of this paper was to review and discuss the literature on parent-infant interaction and resiliency. It presents an overview of the outcomes associated with parent-infant interaction on selected at-risk populations. A relationship was identified between high-quality parent-infant interaction and the promotion of resilient outcomes in children. Potent risk factors that threaten the quality of parent-infant interaction and thus resiliency in infants and young children were also identified. Finally, I proposed a theory for a clinical intervention aimed at promoting the quality of parent-infant interaction in an effort to promote resiliency in selected risk groups.

Manuscript Two

The second manuscript is entitled "Improving Adolescent Parent-Infant Interactions: A Pilot Study". Reported in this manuscript are findings relating to the dependent variables of parent-infant interaction, contingent responsiveness, and infant cognition. Results indicate that the intervention, aimed at improving the quality of parent-infant interaction, produced a significant change in the adolescents and infants who underwent the program. The major conclusion from the paper is that helping adolescent parents to sensitively respond to their infants' states, behaviours, and cues may function to improve parent-infant relationships and infant cognition. As well, trends in the data for infants' visual expectations show promise and provide encouragement to continue using and refining the VEXP instrumentation. Ample evidence is presented to support the feasibility of conducting the larger study to follow from this one.

Manuscript Three

The third manuscript is entitled "From Nursing Intervention to Research Protocol in Five Steps". The feasibility of the commercially available intervention program utilized in this study was assessed and converted into a research protocol. In spite of the importance, few descriptions have been published about the conversion of clinical intervention programs into research protocols. This manuscript describes the process of converting nursing interventions into comprehensive and carefully constructed research protocols in five steps--identification, development, validation, testing, and adaptation. Keys to Caregiving, the commercially available nursing intervention program utilized in this study, serves as an example of the conversion process.

Manuscript Four

The fourth manuscript is entitled "Attrition Among Adolescents Involved in a Parenting Program". The stresses of parenthood in combination with the stresses of adolescence increase the likelihood that adolescents will drop out of research studies. This poses design and analysis problems for the successful implementation and testing of interventions for adolescent parents. The purpose of this paper was to identify factors related to adolescent mothers' attrition in an effort to prevent problems with attrition in future studies. In order to do so, adolescents who completed all aspects of the pilot study were compared with those who did not complete the study. The discussion focused on two main factors that contributed to attrition--subject stress and being in the control group. Several suggestions were made to address these factors in an effort to prevent or reduce attrition.

Manuscript Five

The fifth manuscript presents the findings of the intervention, but targets the vastly diverse audience of Canadian nurses in practice, academic, teaching and policy settings. While the findings reported in the second manuscript are summarized here, the audiences are different and the thrust of this paper is to provide a brief but comprehensive review of the study and its implications for nurses in various settings. The manuscript provides a brief summary of the study and its findings to facilitate widespread dissemination of the research results to nurses. Recommendations are posed to encourage nurses to implement and support interventions aimed at improving parent-infant interaction in young at-risk families. Nurses are challenged to lobby and obtain support for programming to promote optimal parent-infant interactions in multiple settings and populations.

Summary of Appended Materials

As this is a feasibility study, more data were collected and analysed than could reasonably be reported in the dissertation manuscripts. Further, the manuscripts were tailored for publication. For example, the demographic data on difficulty of life circumstances was collected at multiple time points in the study, but due to attrition, only that collected at the time of enrollment was reported. Such additional analyses are reported in the appendices at the end of the dissertation as are most of the tabulated results of the study.

I have also included some pertinent information in the appendices including a table outlining data collection time points, details about the psychometric properties of the scales, information about the promising reliability and validity of the VEXP, the consent forms (which doubled as information letters), the final research protocol manual, and a summary of recruitment and retention strategies developed during the feasibility study. Potential changes to the technique for administering the VEXP and the VEXP data reduction procedures are also outlined.

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MANUSCRIPT ONE

FOSTERING RESILIENCY IN INFANTS AND YOUNG CHILDREN THROUGH PARENT-INFANT INTERACTION[1]

Abstract

High-quality parent-infant interaction has been linked to resilient outcomes characterized by secure infant attachments, as well as infant and child cognitive and social-emotional development. The purpose of this paper is to show that: 1. High-quality parent-infant interaction is important in the promotion of child resiliency; and 2. High-quality parent-infant interaction ought to be promoted in family-centred early intervention. Research is reviewed that shows the relationship between high-quality parent-infant interaction and resilient outcomes. Potent risk factors that threaten the quality of parent-infant interaction and thus resiliency in infants and young children are also reviewed. Finally, clinical guidelines for assessing and intervening to promote parent-infant interaction are suggested.

Key Words: Parent-infant interaction, resiliency, protective factor, risk factors, early intervention.

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[1] This chapter has been published. Letourneau 1997. Infants and Young Children. 9(3): 36-45.

FOSTERING RESILIENCY IN INFANTS AND YOUNG CHILDREN THROUGH PARENT-INFANT INTERACTION

Resiliency refers to individuals' competence and successful adaptation in the face of significant adversity, such as biological risk factors or stressful life events.[1,2] In this context, resiliency represents a state or characteristic within the individual. Protective factors, such as high quality parent-infant interaction, mediate the effects of adversity to promote resilient outcomes in the individual. The mediation of adversity by protective factors may be thought of as a process of successful interaction between individuals and their environments.[3] Recognizing that infants' environments are greatly influenced by their parents/caregivers, the interaction between growing infants and their parents, can make or break the reserve of resiliency necessary for infants and children to successfully negotiate life stressors.[4] Promoting high-quality parent-infant interaction can provide the reserve of resiliency that will promote infants' and children's continued low susceptibility to future stressors. The purpose of this paper is to show that:

1. High-quality parent-infant interaction is important in the promotion of child resiliency; and

2. High-quality parent-infant interaction ought to be promoted in family-centred early intervention.

Parent-Infant Interaction as a Protective Factor that Promotes Resiliency

Werner and Smith[2] reporting on their 30-year follow-up of resilient adults exposed to stress in infancy, found that "the developmental outcome of virtually every biological risk condition was dependent on the quality of the rearing environment"(p 191). High-quality interaction between parents and their infants and young children was the most important component of a positive rearing environment. According to Barnard and colleagues, high-quality parent-infant interaction is characterized by mutual warmth, sensitivity, and responsiveness.[5] In order to interact successfully, parents and infants each bring a repertoire of important behaviours and skills. Infants must send clear cues about their needs and wants while parents must recognize and respond to infants' needs. For example, infants must clearly indicate that they are in distress or that they want to engage in play so that parents can respond appropriately. Further, both parents and infants must be contingently responsive by, for example, smiling at or vocalizing to each other in turn. Parents and infants must also be able to provide rich content to the interaction such as verbal stimulation and mutual involvement in games. Finally, changes in the interaction patterns must keep pace with infants' development. For example, parents need to adapt activities to provide new challenges and opportunities for success.[5]

High quality parent-infant interaction has been linked to the development of secure infant attachments to caregivers, infant and child cognitive and social-emotional development, and peer competence.[6] Commonly cited in the literature, these outcomes characterize resilient infants and children. In contrast, developmental delays such as failure to thrive in otherwise healthy infants,[7] have been linked to less than optimal parent-infant interaction. The following section will describe attachment security as well as cognitive, language, and social-emotional development as results of high-quality parent-infant interaction.

Attachment Security

Attachment security has traditionally been assessed by the Ainsworth Strange Situation procedure.[8] It consists of laboratory observations of episodes in which the parent and a stranger interact with, depart from, and reunite with the infant. As the episodes proceed through the separations from the parent, the infant is assumed to become stressed with an increasing need for closeness to their parent. The infant's ability to cope with the separations has been considered indicative of the quality of attachment. Traditionally, the quality of infant attachment has been classified as secure, insecure "avoidant", or insecure "ambivalent/resistant". Generally, securely attached infants use their attachment figures as secure bases for exploration of their environments. Mothers of secure infants have also been characterized as more sensitive, responsive, and accessible to their infants in the first year of life than mothers of insecure infants.[9]

High-quality parent-infant interaction has been repeatedly linked to infants' secure attachments to their caregivers. In one such study, it was found that infants judged to be securely attached at one year of age had mothers who were more often contingent in their pacing and encouraging of further interaction when their infants were six to 15 weeks of age, as observed in early face-to-face interactions. In contrast, infants judged to be insecurely attached at one year of age had mothers who more frequently initiated face-to-face interaction with a silent, impassive face and more often failed to respond to their infants' attempts to initiate interaction.[10] In another study, insecurely attached infants identified at 13 months had mothers that were less likely to vocalize, look at, touch, or play with their infants at seven months of age when compared to securely attached infants.[11] Others found that infants later judged to be securely attached had more early experiences of reciprocal interaction[12] and more verbal, responsive, cooperative and sensitive mothers than insecurely attached infants.[13,14]

In addition to being related to early parent-infant interaction quality, attachment security has been related to subsequent improvements in the development of infants and young children, including IQ, social-emotional development, and peer competence. Ainsworth and Bell found that infants' secure attachments correlated both with increases in exploratory behavior and IQ's among 11-month-old infants,[15, 16] while others found that infants judged to be securely attached at 18 months had higher, albeit nonsignificant, IQ's at 23 months.[17] In a study of two- and three-year-old children, it was found that secure mother-child attachment was correlated with several measures of peer competence as assessed in observations of young children in free-play sessions with unfamiliar peers. Secure attachment correlated positively with peer responsiveness and reciprocal interaction, and negatively with unsociable behavior such as physical aggression, verbal threats, and crying.[18] Similarly, findings from another study revealed that children judged to have behavior problems at four and five years of age were insecurely attached at 12 and 18 months of age.[19]

In summary, parent-infant interaction is linked to attachment security, while attachment is linked to cognitive ability, social ability, and the quality of peer relationships. Parent-infant interaction appears to be indirectly related to later development mediated through attachment security. Studies that examine the direct relationship between high-quality parent-infant interaction and cognitive, language, and social ability will now be reviewed.

Cognitive, Language, and Social-Emotional Development

It has been repeatedly demonstrated that the quality of parent-infant interaction promotes cognitive, language, and social-emotional development.[6] These developmental outcomes have been used by many researchers to demonstrate components of competence or resiliency in infants and children. The following review describes significant studies that show the relationship between high-quality parent-infant interaction and development.

Many researchers have examined the link between the quality of parent-infant interaction and cognitive and/or language development. In one such study, six, 13 and 24 month-old infants/children were found to be have higher IQ scores and language competence at 24 months when exposed to warm, verbal interactions at each age.[20] Further, characteristics of high-quality parent-infant interaction such as frequent maternal stimulation correlated with the size of infants' speaking vocabularies at 12 months of age,[21] while the characteristic of maternal responsiveness in infancy correlated with IQ scores when the children were as old as six years of age.[22] Kindergarten teacher ratings of academic competence and promotion to grade one have also been correlated with mother-infant interaction in infancy during bathing, dressing, and play.[23] In these studies of cognitive and language ability, it appears to be the quality of the contingent relationships between mothers and infants, rather than the shear quantity of infant stimulation, that is positively related to cognitive development.[24] Others have found that, in addition to cognitive and language ability, the development of social ability among two-year old children is related to early parent-infant interaction experiences, such as mothers' positive and responsive interaction and language to the child. Further, children's sociability to adult strangers has been related to the quality of mother-child interaction.[25]

Similar relationships between high-quality parent-infant interaction and development have also been observed with preterm or low-birth weight infants. Interactions as early as one month of age characterized by caregiver attentiveness and contingency, mutual visual regard, and face-to-face talk were correlated with IQ scores and language development at age 2, and with IQ at age five and age eight.[26-28] Further, in a four-year study of mothers and preterm infants, while perinatal or infant status were found to be extremely weak predictors of children's IQ at four years of age, assessments of mother-infant interaction were among the best predictors of child performance in predicting IQ and language ability.[29] In another study, preterm children whose mothers had been consistently more responsive in infancy had higher IQ and arithmetic scores, more positive self-esteem, and their teachers reported fewer behavioural and emotional problems at age 12 than children whose mothers were consistently less responsive in infancy and at age 12.[30] These findings have been repeatedly demonstrated, suggesting that the quality of parent-infant interaction may play a larger role in the development of resiliency than perinatal complications.[31, 32, 33]

In summary, ample research exists to demonstrate the direct relationship between high-quality parent-infant interaction and developmental outcomes indicative of resiliency. Further, it is suggested by some research that the quality of parent-infant interaction may play a larger role in the promotion of resiliency than risk factors such as prematurity or low birth weight. The effect of selected risk factors on parent-infant interaction will now be described.

Risk factors that Threaten Parent-Infant Interaction

To promote high-quality parent-infant interaction, certain prevalent risk factors must be taken into account in family-centred assessment and intervention. Infant characteristics such as health status and temperament, and parental characteristics such as depression and adolescent parenting are highlighted as potent risk factors that threaten the quality of parent-infant interaction. Poverty or low socioeconomic status is also a potent factor that tends to compound the effects of other risk factors.

Infant Characteristics

Although research has shown that the quality of parent-infant interaction is a more powerful predictor of resilient outcomes for children than biological risk factors, such as preterm birth or low birth weight,[2, 32, 33] infants with biological risk conditions are more likely than healthy infants to have less than optimal parent-infant interactions. A study of parent-infant interaction during feeding when the infant has congenital heart disease (CHD) found that infants were less responsive to their caregivers and gave fewer clear cues than healthy comparison infants. Further, mothers of infants with CHD provided fewer social-emotional growth fostering activities, such as smiling and praise.[34] In contrast to comparison infants, infants with cranio-facial anomalies,[35] infants with intra uterine growth retardation,[36] and infants exposed to cocaine,[37] interacted less well with their mothers. Infants with cranio-facial anomalies smiled and vocalized less than comparison infants, while their mothers less frequently smiled, vocalized, imitated behaviours, responded contingently, and played games. Cocaine-exposed infants gave fewer clear cues and were less responsive to their mothers, while their mothers were also less sensitive to the infants' cues than comparison mothers and infants.

The infant's temperament also plays an important role in the quality of parent-infant interaction. Researchers have suggested a link between excessive early infant crying or colic and decreased maternal responsiveness that may reduce the quality of parent-infant interaction.[38-40] In particular, infants described as having difficult temperaments based on being irregular in feeding and sleeping schedules, being less adaptable to new people and situations, and having more negative moods, were found to engage in less mutual vocalization with their mothers.[41] In summary, while infants' biological risk factors play a role in determining the quality of parent-infant interaction, infants' temperamental characterstics also affect the way in which the infant contributes to and shapes the interaction. Risk factors that threaten parents' contribution to the interaction are next discussed.

Depression

Beck recently completed a meta-analysis of the literature linking postpartum depression to less than optimal parent-infant interactions. She concluded that postpartum depression had a moderate to large effect on the quality of parent-infant interaction.[42]

A review of selected studies illuminates the threat. When compared to infants of depressed mothers, it was found that three-month old infants of nondepressed mothers showed more frequent positive facial expressions and vocalized more to their mothers. Nondepressed mothers also showed more frequent positive facial expressions, vocalized more, and spent more time looking at and providing tactile stimulation to their infants than depressed mothers.[43] Depressed mothers of two-year-old children were both less responsive to their children and less able to sustain social interaction with their children, while the children were also more often distressed, when compared with nondepressed mothers and children.[44] Depressed mothers have also been reported to provide significantly lower levels of unconditional positive regard for their infants, an important component of high-quality parent-infant interaction.[45] A study that links maternal depression to interaction quality and attachment security found that depressed mothers are more likely to show hostile and intrusive behaviour toward their infants, while the infants of depressed mothers are likely to exhibit decreased cognitive development and insecure attachment.[46] Another study points to the interplay of risk factors that threaten the quality of parent-infant interaction. Measures of parent infant interaction at 3 months, but not at 6 weeks were antecedent to security of attachment at 13 months. A potential explanation for the nonsignificantly different parent-infant interaction scores at six weeks may have been due to the higher reported levels of maternal depression in the securely attached dyads at intake into the study.[14] In general, depression is a prevalent risk factor that must be taken into account in family-centred assessment and intervention to promote the quality of parent-infant interaction. Adolescent parenting and the related risk factor of having less educational experience is next discussed.

Adolescent Parenting

A review of results from several studies indicates that adolescent mothers are more likely to be insensitive to infants' cues, have a nonverbal style of interaction, and provide inadequate infant stimulation.[47] It has also been found that adolescent mothers do not imitate their infants or elaborate on their infants' vocalizations during interactions.[48] Adolescent mothers, when compared with older mothers, were found to be less sensitive to their infants' cues and provided fewer social-emotional growth-fostering experiences observed during feeding interactions with infants between four and 12 months of age.[49] Frequently, less than optimal parent-infant interactions have been attributed to the more limited educational experiences and opportunities of adolescent parents.[50, 51] In the large Nursing Child Assessment Satellite Training (NCAST) sample from the University of Washington, no significant differences have been found between parent-infant interactions of adolescents when compared with parent-infant interactions of adults with less than grade 12 education.[52] These findings have been repeatedly demonstrated.[53-56] The compounding effect of poverty on the quality of parent-infant interaction is next described.

Poverty

Poverty or low socioeconomic status have been frequently described as doubling or compounding the existing risk conditions to which infants and young children are exposed.[2, 57] Since children living in poverty are more frequently exposed to medical illnesses, family stress, inadequate social support, and parental depression, they are doubly at risk for less than optimal outcomes. Further, infants and young children in poverty also experience more serious consequences to these risks than their peers from higher socioeconomic groups.[57] Werner and Smith[58] found both that 67% of two-year-old children with severe perinatal complications were from the lowest socioeconomic group and that the children with the lowest IQ's among the entire study population of two-year-olds were from the lowest socioeconomic group. The researchers have summarized their findings by saying that "perinatal complications were consistently related to later impaired...development, *only* when combined with persistently poor environmental circumstances" such as chronic poverty.(p31) Not surprisingly, reductions in the quality of parent-infant interaction have been directly linked to poverty conditions. Less than optimal parent-infant interactions were observed between mothers and seven- to 12-month-old infants from a low socioeconomic sample when compared to mothers and infants from a high socioeconomic sample.[36] The threat of the compounding effects of poverty on the quality of parent-infant interaction and the development of resiliency in infants and young children cannot be underestimated.

In summary, infant characteristics such as health status and temperament function to reduce the quality of parent-infant interaction, as do parent characteristics such as depression, young age, or less educational experience. Poverty tends to compound the effect of both infant and parent characteristics and must be taken into account in family-centred assessment and intervention. Intervention has been successfully conducted with these risk groups to improve the quality of parent-infant interaction.

Intervention Studies

A relationship between high-quality parent-infant interaction and outcomes that either indirectly (attachment security) or directly (cognitive, language, and social-emotional development) promote resilient developmental outcomes has been demonstrated. In addition, research shows that interventions targeted at promoting high-quality parent-infant interaction may be effective in promoting resiliency in risk groups including adolescent parent families, families with premature and low birth weight infants, families from poor socioeconomic conditions, and families suffering from the effects of depression. One such study examined socioeconomically at-risk mothers' and infants' responses to a community-based treatment that started prenatally and lasted until the infants were six months old. The treatment group was provided with a wide spectrum of preventive interventions, including teaching parents about infant cues, positioning during interaction, and how to elicit verbal and visual alerting responses from their infants. Mothers in the treatment group were found to have higher quality parent-infant interactions than either of the comparison groups.[59] Other studies have involved preterm, low-birth weight infants exposed to interventions designed to improve parent-infant interaction. In comparison to controls, the intervention infants responded to the treatment with greater effect on measures of cognitive development,[60,61] whereas the parents and infants had greater improvements in their interactions during feeding and playing.[62] Further, lower birth weight infants were found to be more responsive to intervention than higher birth weight infants.[60,61] In studies of adolescent parents, intervention has been effective in preventing parent-infant interaction disturbances,[63] and in increasing the level of parent and infant responsiveness in interactions.[64] Finally, in a study of first-grade children, it was found that high-quality mother-child interaction mediated the relationship between maternal depressive symptomatology and child behavior problems, even when the effects of socioeconomic status were taken into account.[65] In summary, ample evidence demonstrates that intervention targeted at promoting high-quality parent-infant interaction is warranted.

- Figure 2-1 -

Clinical Implications

The model depicted in Figure 2-1 outlines the structure of the previous discussion. Clinical assessment of risk factors consisting of infant characteristics, parental depression, adolescent parenting, and poverty indicate the need for assessment and intervention targeted at improving the quality of parent-infant interaction. Improved attachment security as well as improved cognitive, language, and social abilities may result from high-quality parent-infant interaction. Although some research has suggested that intervention aimed at promoting high-quality parent-infant interaction can have its greatest impact on the highest risk groups,[28,29,60,61] all may benefit from such intervention. Health-care professionals and paraprofessionals working with infants and young children need to implement programs which:

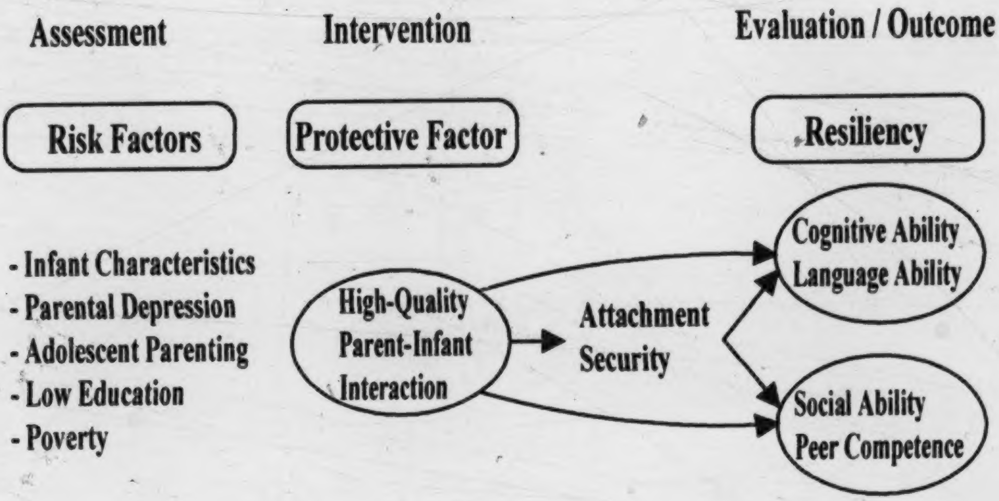
1. Promote high-quality parent-infant interaction in multiple settings, such as maternity wards, community practice, primary health care centres, day care centres; 2. Incorporate teaching about high quality parent-infant interaction into prenatal education for expectant parents; 3. Conduct assessments of parent-infant interaction in families experiencing risk factors and provide follow-up care and assessment; 4. Incorporate content on parent-infant interaction into health-care professionals' and paraprofessionals' educational curricula. 5. Use available tools to assess and intervene to promote high-quality parent-infant interaction.

High-quality parent-infant interaction should be promoted and practised by health-care professionals and paraprofessionals in multiple settings. Intervention should begin prenatally and more intensive service should be provided to families experiencing identified risk factors.[66] Families should be followed until it is established that their parent-infant interactions are of a sufficient quality to maintain and promote infant and child development. Several sources of information about high-quality parent-infant interaction are available for health-care professionals and paraprofessionals working with young families.[67,68] In particular, the Parent-Caregiver Involvement Scale[69] and the NCAST Feeding[6] and Teaching Scales[52], are frequently used in clinical practice settings. The Keys to Caregiving program from NCAST Programs also provides essential information about high-quality parent-infant interaction in a self-instructional format.[70]

With the help of these tools, high-quality parent-infant interaction should be incorporated into prenatal education as part of structured programs, community-health nursing visits, or visits to physicians' offices. Reinforcement of high-quality parent-infant interaction should be conducted in hospital maternity wards or birthing centers, and follow-up at home is essential, especially given the recent trend toward short-term maternity hospital stays. Community-health nurses should routinely incorporate the observation of parent-infant interaction into postpartum nursing visits and provide feedback and follow-up. Community health centers could conduct clinics that serve both expectant and new parents' needs for knowledge about high-quality parent-infant interaction. New parents would have the opportunity to demonstrate their own infants' capabilities, cues, and responses for expectant parents, in an atmosphere of mutual learning. Community-health nurses and other health-care professionals should also teach paraprofessionals and those working with infants and young children about high-quality parent-infant interaction, targeting day care centers and child care workers. The concepts of high-quality parent-infant interaction should become mainstream in the education of health-care professionals and para-professionals who work with young families, infants and children. In order to support these efforts, policy-makers must be made aware of the relationship between family-centred early intervention targeted at promoting high-quality parent-infant interaction and resiliency in infants and young children.

In conclusion, the tools are available and the incentive is there to assess and intervene to promote cognitive, language, and social-emotional development in infants and young children. The importance of high-quality parent-infant interaction in the development of a reserve of resiliency in infants and young children cannot be underestimated. Health-care professionals and paraprofessionals have the ability to promote resiliency by assessing and intervening to improve the quality of early caregiving for all.

Figure 2-1. **Clinical Model of Parent-Infant Interaction**


Assessment
Intervention
Evaluation / Outcome
Risk Factors
Protective Factor
Resiliency
- Infant Characteristics
- Parental Depression
- Adolescent Parenting
- Low Education
- Poverty
High-Quality Parent-Infant Interaction
Attachment Security
Cognitive Ability
Language Ability
Social Ability
Peer Competence

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MANUSCRIPT TWO

IMPROVING ADOLESCENT PARENT-INFANT INTERACTIONS: A PILOT STUDY[2]

Abstract

Background: The stresses of adolescence in combination with the stresses of parenting make sensitive and responsive caregiving a challenge for adolescent parents.

Objective: To conduct a pilot study of a program to improve the quality of interaction and contingent responsiveness between adolescent mothers and infants.

Methods: A mixed factorial design was used in this study. First time adolescent parents aged 15-19 years, received either the Keys to Caregiving program delivered by 6-weekly visits or a control program consisting of 6-weekly neutral visits by a nurse. Parent-infant interactions during teaching and feeding, contingent responsiveness, and infant cognitive development were assessed when infants were 7 to 9 and 11 to 13 weeks of age.

Results: ANOVA and independent t-tests were used to analyse the data. The results suggest that the Keys to Caregiving program resulted in significantly better and more contingently responsive interactions, as well as improvements in infants' cognitive ability, when compared to the control group. Moreover, the advantage was maintained for a 6 to 7 week period post-intervention.

Conclusion: This pilot study offers support for the Keys to Caregiving program as well as an illustration of the benefits of the VEXP as a measure of infant cognition. It also

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[2] A version of this chapter has been submitted for publication.

provides insights into changes in the VEXP technique for future research.

Key Words: parent-infant interactions, adolescent parenting, infant cognition

IMPROVING ADOLESCENT PARENT-INFANT INTERACTIONS:
A PILOT STUDY

Sensitive and responsive parenting is a challenge for any parent; for the still developing adolescent it may be even more so. Compared to older mothers, adolescent mothers' interactions with their infants have been characterized as being less sensitive to infant cues, more unrealistic about expectations of infant behaviour, less verbal and responsive toward their infants, more impatient, and more prone to use physical punishment (Barnard, 1997; Ruff, 1987; vonWindeguth & Urbano, 1989). These behaviours place the children of adolescents at risk for less than optimal development. In contrast, children reared in environments characterized by high-quality parent-infant interactions are likely to demonstrate successful developmental outcomes such as readiness for school, social skills, peer competence, and cognitive ability (Sumner & Spietz, 1995a; Werner & Smith, 1992; see Letourneau, 1997 for a review).

High quality parent-infant interactions are characterized by mutual warmth, sensitivity, and responsiveness (Barnard, et al., 1989). For high quality interactions, infants must send clear cues about their needs and wants while parents must be sensitive and able to respond to infants' needs. When these social interactions are mutual, they are referred to as being ***contingently responsive***: the behaviour of one evokes the appropriate response of the other. An example of a contingently responsive parent-infant interaction is demonstrated by a parent speaking followed by the child turning to listen or vice versa (Barnard, 1997). Contingent actions and reactions by parents and infants characterize optimal interactions that also favour children's successful development (Sumner &

Spietz, 1995a; Tarabulsky, Tessier & Kappas, 1996). All interactions need not be contingent however, it is rather the overall proportion of contingently responsive interactions that favours children's development (Chamberlain & Patterson, 1995).

Infants reared by parents in stressful circumstances or with little knowledge of parenting or infant development may not experience optimal interactions. Parents with a lack of education or experience, such as adolescent parents, are particularly at-risk for less than optimal parent-infant interactions (Censullo, 1994; Irvine, Bradley, Cupples, & Boohan, 1997; Porter, 1990). Examples that characterize less than optimal parent-infant interactions include a parent's lack of affection or attentiveness, or a child's tendency to overstimulation.

Adolescent parents stand to benefit from intervention that improves parent-infant interactions. Adolescent parents are more likely than older mothers to abandon further education (Hayes, 1987) and to live in poverty (Wilkins, Sherman & Best, 1991), both factors that contribute to stresses that may negatively influence the quality of parent-infant interaction. In addition, adolescents' stage of development (Trad, 1995; Yoos, 1987) combined with the risk of experiencing postpartum depression (Beck, 1995) may lessen their emotional availability to their infants, with potential consequences for parent-infant interactions. It is not surprising, given these risk factors, that offspring of adolescents are prone to less than optimal outcomes.

The quality of contingent responsiveness in parent-infant interactions has been linked to cognitive development in children (Beckwith & Cohen, 1989; Beckwith, Rodning, & Cohen, 1992; Bornstein & Tamis-LeMonda, 1989; Coates & Lewis, 1984;

Dunham, Dunham, Hurshman, & Alexander, 1989; Lewis & Coates, 1980). However, only two studies have been identified that examined the relationship between contingent responsiveness and the development of infant expectations, as an aspect of infant cognition (Lewis & Goldberg, 1969; Hains & Muir, 1996). Contingently responsive social interactions may enable infants to develop expectations that their behaviour is effective (Lewis & Goldberg, 1969). As an example, consistent turn-taking between a parent and infant in conversations and activities fosters the development of the infant's ability to predict events. These expectations in turn motivate exploration, learning, and the practice of new skills that contribute to cognitive development (Goldberg, 1977). Both Barnard et al. (1989) and Haith (1993) suggest that these relationships have not been sufficiently investigated.

Nursing intervention programs have been developed to promote sensitive and contingently responsive parent-infant interaction; however, few programs have been extensively tested before use in practice. Given the special risks associated with adolescent parenting, rigorous testing of such interventions is imperative. The effects of a nursing intervention program designed to improve the quality of interaction and contingent responsiveness between adolescent mothers and infants were examined in this study. The major outcome variables examined include (1) parent infant interaction, (2) contingent responsiveness within parent-infant interactions, (3) infant cognitive development, and (4) infant expectations as an aspect of cognitive development. It is hypothesized that the intervention program will produce improved parent-infant interactions and enhance cognitive development.

Methods

Sample

Forty-nine eligible adolescents were approached within the first week postpartum to participate in this study. They were deemed eligible if 13 to 19 years of age, first-time inexperienced primary caregivers, having an uneventful postpartum recovery, not known to have abused alcohol or drugs during pregnancy, able to read and write English, and residents of a large Western Canadian city or surrounding area. Eligible infants were healthy singleton births of at least 35 weeks gestation, weighing at least 2500 grams at birth, and discharged into mothers' care by 8 days of age.

Procedures

Ethical approval and permission to conduct the study were obtained from the appropriate institutions before commencing recruitment and data collection. Adolescent mothers who met the selection criteria were approached either in hospital before discharge or by telephone shortly after discharge. Informed consent was obtained. Participants were told that the purpose of the study was to assess programs to help infant development and health and that they would receive six home visits from a registered nurse. In order to reduce threat of bias, participants were not informed about differences in the two programs until the end of the study.

Twenty-four mothers (ages 15 to 19 years) agreed to participate. All discussions with participants about the details of the study took place before random assignment to groups. This created a partial blind (Christensen, 1994). Hence expectations about study results could not be conveyed differentially to the intervention and control group participants.

Participants were randomly assigned to either the intervention (n=13) or control (n=11) group based on a random assignment schedule that had been developed prior to commencement of the study. Small sealed envelopes, each containing an assignment to a group, were randomly matched with a case number. Once the sealed envelope was opened, a nurse-interventionist initiated plans for the assigned intervention. The same nurse provided both control and intervention programs.

Mother-infant pairs from both groups were visited weekly to provide the intervention or to receive a neutral visit. There were six weekly visits which took place when the infant was less than 1 week to 6 weeks of age. The infants visited the perinatal clinical lab twice for assessment following the program (when 7 to 9 weeks and 11 to 13 weeks of age).

Design and variables. A 2 x 2 mixed model factorial design was employed for this study. The two independent variables were Group (intervention, control) and Age (7-9 weeks, 11-13 weeks). The between groups variable was Group and the within groups variable was Age. The primary outcome variables were: parent-infant interactions during teaching and feeding, contingent responsiveness, and infant cognitive development.

Intervention group. The Keys to Caregiving program was used to teach parent-infant interactions and to promote contingent responsiveness (NCAST, 1990). The intervention began once the participants were discharged. One topic from Keys to Caregiving was presented each week: infant states - week 1, infant behaviours - week 2, infant cues - week 3, state modulation - week 4 and feeding interaction - week 5.

Participants were provided with the appropriate Keys to Caregiving information pamphlet prior to each home visit. A final visit was made between weeks 5 and 6 of the study to reinforce and review the Keys to Caregiving materials. During home visits, the concepts in the pamphlets and how they applied to the participant's new infant were discussed. Participants were encouraged to relate examples of the behaviours discussed to their everyday understanding of their own infants. A brief video was shown of babies exhibiting the same and different behaviours than were observed in the participant's new infant. As participants proceeded through the intervention program and continued to build on their knowledge, they learned when and how to interact with their infants in contingently responsive ways to promote optimal development.

Flexibility was built in to the program to meet individual needs. If the participant asked about a topic to be presented later on, the nurse interventionist was permitted to leap ahead in the program, in the form of incidental teaching. When this occurred, the topic was also covered during the week it was scheduled. As a result, incidental teaching relating to a program topic was reinforced at the regularly scheduled time. As well, incidental teaching about basic infant care or postpartum concerns occurred as needed. Events occurring during each visit were documented.

Control group. Participants were treated identically to the intervention group except that they did not receive the parent-infant interaction intervention program. They were visited by a nurse on the same schedule as the intervention group, with the objective of providing support. There was no preplanned discussion about parent-infant interactions or contingent responsiveness. Only incidental teaching about basic infant care or postpartum concerns occurred in response to remarks made by participants during the visit. This strategy controlled for potential confounding effects associated with receiving a visit from a nurse since both groups received a visit and only the content of the visit differed. After each visit, events that occurred were documented. Participants experienced an abbreviated form of the parent-infant interaction intervention at the end of the 3-month study.

Data Collection

Measures of socioeconomic status, post-partum depression, and difficulty of life circumstances were obtained in order to identify potential confounds to the study. Whenever necessary participants were assisted to complete questionnaires.

Demographic data. Demographic information was collected by chart review and informal interviewing as part of scheduled home visits. The Hollingshead (1965) Four-Factor Index of participants' socioeconomic status was calculated for all participants. Potential scores range from 8 to 66 with lower scores associated with more socioeconomic disadvantage.

Edinburgh Postnatal Depression Scale (EPDS). The EPDS is a short, structured, self-report measure (Cox, Holden, & Sagovsky, 1987). The scale has 10 items, with a possible range of scores from 0 to 30, with higher scores indicating more symptoms. A score of 12 or more indicates depressive illness. The questionnaire was administered at both data collection times (7 to 9 weeks and 11 to 13 weeks).

Difficult Life Circumstances Scale (DLC). The DLC is a 28 item binary scale that assesses the existence of stressors or chronic problems in families that may affect the quality of parent-infant interaction (Barnard, 1989). A score of 6 or more is associated with less than optimal child developmental outcomes. The questionnaire was administered at entry to the study.

Nursing Child Assessment Feeding (NCAFS) and Teaching (NCATS) Scales. The NCAFS and NCATS (Sumner & Spietz, 1995a & 1995b) are the most widely used observational measures of parent-infant interactions and may be used to assess the contingent responsiveness of parents and infants to one another. These binary scales provide two conceptually parallel descriptions of social interaction between parents and infants, effectively increasing the generality of the observations across settings and providing a more comprehensive picture than when these scales are used alone. The scales allow for the examination of the ***Total*** (overall) interaction, and subscales examine the ***Parent*** and ***Child*** contributions, and the degree of ***Contingent Responsiveness*** in the interaction.

Both scales have been normed on a large sample of children and are suitable for administration to children under a year of age (Sumner & Spietz, 1995a, 1995b). It has been repeatedly demonstrated that the measures are predictive of later relationships and behaviour related to successful outcomes in children (Barnard, 1995). The normed means and standard deviations of the NCAFS and NCATS database are available on a comparable sample of adolescents aged 13 to 19 years. As well, tenth percentile cutoff scores, indicative of clinically relevant or "worrisome" interactions are reported in the literature. Table 3-1 presents these data as well as the maximum possible scores attainable on the scales and relevant subscales.

Table 3-1

Maximum Scores and Normed Data: NCAFS and NCATS Scales

		Max.	Mean	10th Percentile Cutoff
NCAFS	**Total Scale**	76	56.71(9.46)	52
	Parent Subscale	50	37.76(6.87)	36
	Child Subscale	26	18.95(3.87)	15
	Contingency Subscale	18	not available	not available
NCATS	**Total Scale**	73	52.26(10.27)	47
	Parent Subscale	50	37.38(7.56)	34
	Child Subscale	23	14.87(4.64)	10
	Contingency Subscale	32	not available	not available

Standard deviations in parentheses.

Mothers and babies were videotaped in a laboratory setting during feeding and teaching interactions at 7 to 9 weeks postpartum and again at 11 to 13 weeks postpartum. A Certified Instructor taught one data coder, blind to participants' group assignments, to score the tapes according to the NCAFS and NCATS protocols.

Prior to coding the dependent variables of NCAFS and NCATS, the data coder achieved inter-rater reliability of ≥90% with videotapes previously scored by the University of Washington, NCAST Institute. As a check on intra-rater reliability, a random numbers table was used to select six of the thirty-one NCAFS and six of the thirty-one NCATS for rescoring. The mean intra-rater reliability was 95.3% (range=90%-99%) for the NCAFS, and 94.0% (range=90%-97%) for the NCATS.

Visual Expectation Paradigm Test (VEXP). The VEXP measures the development of infant expectations, as an aspect of cognition (Haith, Hazan, & Goodman, 1988). The test involves structured observations of infants' eye movements. It was administered to the infants in the laboratory setting at 11 to 13 weeks of age. The VEXP shows promising reliability and validity, as compared to other measures of infant cognition (e.g. the Gessell Developmental Schedules, the Bayley Mental Development Index, the Catell Infant Intelligence Scale) (Bensen, Cherny, Haith, & Fulker, 1993; DiLalla et al., 1990; Dougherty & Haith, 1997; Haith & McCarty, 1990).

A simplified method of conducting the VEXP was developed and tested in the pilot study due to the expense of the conventional technique. Essentially, modifications involved the use of videotape technology. Whereas Haith and colleagues measured and recorded the centre of the infants' pupils from frame to frame with computer technology, the simplified technique utilized observers' judgements to identify infants' eye movements.

The VEXP was initiated when the infant was in an alert and non-fussy state. The test was administered to the infant reclining in an infant seat directly in front of and facing a television. A screen was placed around the infant to ensure that attention remained on the television and not other environmental stimuli. A video camera was positioned above the TV screen and directed so that the infant's eye movements could be recorded.

A video was shown on the television located in front of the infant. The video presentation consisted of colourful graphically designed stimuli, which moved up and down to attract the infant's attention as each appeared to the right or left of centre. Each stimulus appeared for approximately 700 ms, followed by an approximately 1000 ms interstimulus interval in which the screen was black. After the baseline, consisting of 11 random presentations of stimuli, 80 more visual stimuli appeared in a specified order during the test phase (Benson, Cherny, Haith, & Fulker, 1993; Jacobson et al., 1992). The infant's visual reactions to and anticipations of movement of the stimuli were filmed with a video camera and recorded on videotape during the 3-minute test. For coding purposes, audio signals that corresponded exactly with the presentation of each stimuli (but inaudible to the infants) were recorded on the same videotape.

Reaction time was calculated, using video editing equipment, from the time of the stimulus onset until the time of eye movement. It is generally held that 200 ms is the minimum amount of time in which the human eye can respond to stimuli (Columbo, 1993). During the test phase, if eye movement shifts from one side to the other before stimulus onset or 200 ms after stimulus onset, it can be stated that the infant anticipated or expected the appearance of the stimuli. Faster reaction times or a higher proportion of anticipations may reflect the infant's learning of a spatiotemporal rule (DiLalla et al., 1990). Results were tabulated to reflect the ***Postbaseline Median Reaction Times (RT's) Percentage of Anticipations*** (≤200ms), and ***Percentage of Fast RT's*** (201-301ms).

The VEXP data were examined for reliability prior to analysis. As the VEXP technique was modified, measures of both inter-rater and intra-rater reliability were tabulated. One data coder scored all 15 videotapes, then a random numbers table was used to select 5 tapes for recoding. Three tapes were scored for inter-rater reliability by a second data coder. Data coders agreed 47% of the time about whether or not an anticipation or reaction occurred in response to a stimuli event identified by one or the other as having a response. In cases of agreement, data coders' mean difference in their recordings of RT was half a frame or approximately 17 ms (M=0.52, SD=12.28). The remaining two tapes were scored for intra-rater reliability, and the lone data coder achieved 61% agreement about whether or not an anticipation or reaction occurred to stimuli events in both scorings. In cases of agreement, the lone data coder's mean difference in recording of RT was nearly three frames (M=2.70, SD=10.56).

Bayley Scales of Infant Development II Mental Development Index (MDI).

The MDI (Bayley, 1993), as a general measure of infant cognition, provided cognitive development quotient (***DQ***) scores. The test complemented and served as a reliability check on the more specific VEXP measure of infant expectations, as an aspect of cognition. Considered to be the standard for evaluating general developmental functioning of infants and young children in the cognitive domain, the MDI reflects current norms. The MDI has been recently updated and improved over the previous edition of the Bayley Scales. The test items largely rely on the sensorimotor development of infants in the assessment of cognitive capacity. Much like conventional IQ tests, the MDI is normed so that 100 is the mean performance and 15 is the standard deviation. At 3 months of age, infants must be observed to complete five or more items in an item set, beginning with the 3 month items. The MDI was administered in the laboratory by the investigator who had established reliability. This was done at the second assessment interval, when infants were 11 to 13 weeks of age.

Since the investigator who conducted the IQ tests was aware of participants' group assignments, the test sessions were videotaped to enable an independent, reliable data coder to view 20% of the tapes to provide a measure of inter-rater reliability. The data coder, blind to participants' group assignment, used a random numbers table to select three videotaped sessions for rescoring. The data coder achieved 100% agreement with the investigator on all three MDI's.

Table 3-2

Timing of Administration of Instruments or Tests

	Pre-intervention	7-9 weeks	11-13 weeks
EPDS		✓	✓
DLC	✓		
NCAFS & NCATS		✓	✓
VEXP			✓
MDI			✓

Data Analysis

Hollingshead SES, DLC, and EPDS scores were calculated for each participant. For all of the demographic data, equivalency of study groups was assessed with independent samples t-tests, after ascertaining that none of the independent variables were significantly skewed according to Fisher's test for skewness and that variances were equal according to Levene's Test for Equality of Variance.

Fisher's Tests and appropriate heterogeneity of variances tests (either Levene's, Bartlett-Box, or Box's M Tests) were also conducted on the dependent variables: Total, Parent, Child, and Contingency scores on the NCAFS and NCATS at each time point, MDI scores, and the VEXP data reduced to measure Postbaseline Median RT's, Percentage of Anticipations, and Percentage of Fast RT's. The dependent variables were examined with independent samples t-tests and confidence intervals, 2-way analysis of variance procedures (ANOVA), or Wilcoxin-Mann-Whitney tests as appropriate. The error rate (alpha) for falsely rejecting the null hypothesis of no difference between groups was set at .05. One-tailed t-tests were adopted as intervention was predicted to facilitate development.

Results

Participant Characteristics

Of the 24 mothers who agreed to participate, five dropped out before the visits were completed; one dropped out after the six visits but before the assessment sessions; and 18 completed all visits and one or two follow-up visits, at 7 to 9 weeks and 11 to 13 weeks of infant age. Of the six who dropped out, two families moved away, two were unable to make the time for home visits, one family's infant became ill and was admitted to hospital for an extended period of time, and one mother cited difficulty coping with the demands of motherhood in addition to being involved in the study.

While 18 participants completed all of the home visits and one of the two follow-up visits for assessment, only 15 completed the first follow-up visit at 7-9 weeks (7 intervention, 8 control) and 16 completed the second follow-up visit at 11-13 weeks (8 intervention, 8 control). Of the 16 who completed the second follow-up visit, one control group participant was unable to complete the MDI and VEXP testing. Thirteen participants (6 control, 7 intervention) completed all of the home visits and both the follow-up NCAFS and NCATS assessments.

Demographic data are reported in Table 3-3. All participants reported being the major caregiver for their infants. No significant differences were found with respect to infants' sex, gestational age, infants' birth weights, mothers' years of schooling, EPDS scores, Hollingshead SES scores, or DLC scores on independent samples t-tests for equivalency of groups. In addition, it was revealed by the variance covariance matrix that no significant covariances existed between the demographic variables and the dependent variables, implying that the study findings were likely not confounded by any of the measured variables.

Parent-Infant Interaction and Contingent Responsiveness

Two-way ANOVAs were computed using the data from only those participants who completed all measures of NCAFS and NCATS. Separate analyses were done for Total and Subscale scores. For the NCAFS, significant group main effects included the Total scores (F=4.59, p=.028, n=13), Parent Subscale scores (although the assumption of homogeneity of variance was violated, F=10.2, p=.004, n=13), and Contingency Subscale scores (F=6.21, p=.015, n=13). For the NCATS, significant group main effects included the Total scores (F=4.66, p=.027, n=13), Parent Subscale scores (F=3.95, p=.036, n=13), and Contingency Subscale scores (F=3.59, p=.043, n=13). Neither *Age* nor *Group by Age* effects were significant in any comparisons. Mean scores are reported in Tables 3-4 and 3-5.

Separate independent samples t-tests were also computed for each data collection session and dependent variable. This approach was taken to analyze all data available at any session (participants at the two sessions differed owing to dropouts and incomplete data). Significant differences between the intervention and control groups were found on two of four parent-infant interaction Total scores, three of four Parent Subscale scores,

Table 3-3

Demographic Data

Variable	Mean	Median	Range	n
Age at Birth	18.06(1.01)	18.20	15.96-19.79	18
Years of Education	10.11(1.32)	10.50	8.00-12.00	18
Hollingshead SES	25.97(7.56)	27.50	15.50-36.50	18
DLC	2.50(2.18)	2.00	0-6.00	18
EPDS at 7-9 weeks	7.07(4.15)	7.00	1.00-14.00	15
EPDS at 11-13 weeks	6.69(4.35)	5.00	1.00-14.00	16
Weeks Gestation	39.36(1.05)	39.40	37.50-41.30	18
Birth Weight (grams)	3221(383)	3273	2590-3960	18

Standard deviations in parentheses.

Table 3-4

NCAFS Total and Subscale Score Means for Groups Over Age

	Group	7 to 9 Weeks	11 to 13 Weeks
Total	Intervention	64.6(3.65)	60.9(4.85)
	Control	57.4(6.55)	56.8(4.86)
Parent	Intervention	44.9(2.55)	42.9(2.32)
	Control	39.3(5.92)	37.9(2.85)
Contingency	Intervention	15.6(1.13)	13.6(2.00)
	Control	12.8(2.66)	11.9(2.17)

Standard deviations in parentheses.

and one of four Child Subscale scores. As well, a significant difference was found on two of the four Contingency Subscale scores. Table 3-6 summarizes these findings.

Cognitive Development and Visual Expectations

The groups were compared on the MDI with a Wilcoxin-Mann-Whitney test and found to be significantly different. The intervention group mean was 106 DQ points with a standard deviation 9.56 and the control group mean was 98.4 DQ points with a standard deviation 3.96 (z=2.01, p=.033, n=15).

Table 3-5

NCATS Total and Subscale Score Means for Groups Over Age

	Group	7 to 9 Weeks	11 to 13 Weeks
Total	Intervention	51.6(6.50)	55.1(4.49)
	Control	46.5(9.30)	46.4(9.15)
Parent	Intervention	37.3(4.82)	37.3(4.52)
	Control	32.5(6.63)	31.9(6.29)
Contingency	Intervention	22.3(3.30)	21.9(2.36)
	Control	18.9(5.06)	18.9(3.76)

Standard deviations in parentheses.

Exploratory analyses were done on the three VEXP variables (Postbaseline Median RT's, Percentage of Anticipations, and Percentage of Fast RT's) despite lack of intra and inter-rater reliability in coding. However, the VEXP reliability was assumed to be the same for both groups because the coders were blind to group assignment. A significant difference was found for Postbaseline Median RT but not for Percentage of Anticipations (independent samples t-tests) or Percentage of Fast RT's (Wilcoxin-Mann-Whitney test). Intervention infants reacted on average 204 ms faster to stimuli (approximately 6 frames difference, at 33 ms per frame) than control infants (t=-2.22;

CI=-.402, -.006, p=.023, n=15).

Table 3-6

Group Differences: Parent-Infant Interaction Total Scale and Subscale Scores

Dependent Variable		Intervention Mean	Control Mean	t	Confidence Interval	p
NCAFS 7-9 weeks	Total	64.6(3.65)	57.4(6.55)	2.57	1.16, 13.2	.012
	Parent	44.9(2.55)	39.3(5.92)	2.32	-.378, 10.8	.019
	Contingency	15.6(1.13)	12.8(2.66)	2.60	.476, 5.17	.011[a]
NCAFS 11-13 weeks	Parent	42.9(2.32)	37.9(2.85)	3.91	2.26, 7.75	.001
NCATS 11-13 weeks	Total	55.1(4.49)	46.4(9.15)	2.43	1.02, 16.48	.015
	Parent	37.3(4.53)	31.9(6.29)	1.96	-.501, 11.3	.035
	Child	17.9(2.53)	14.5(4.00)	2.02	-.215, 6.97	.032
	Contingency	21.9(2.36)	18.9(3.76)	1.91	-.364, 6.36	.038

[a] Assumption of equality of variance violated.
Standard deviations in parentheses.

Discussion

This study offers support for a program to improve parent-infant interactions and suggests changes in measurement that would enhance a full trial. The most general conclusion is that Keys to Caregiving, a straightforward and readily useable parent-education program, appears to contribute to the quality of interactions between adolescents and their newborn infants as well as improve infant cognitive development. The following discussion elaborates this general conclusion, followed by recommendations for changes in the VEXP measurement technique.

Effectiveness of Intervention

First, as predicted, intervention aimed at improving the quality of interaction quality of interaction, the parents' contributions to the interaction, and the proportion of contingently responsive parent-infant interactions. In particular, the change in the parents' scores suggests that the educational intervention program successfully targeted and influenced the parents' behaviour in a positive way.

Second, as predicted, the intervention program was successful in producing improvements noted on both measures of the children's cognitive development. While the children's contributions to the overall quality of interaction were not significantly different, the cognitive data suggest that the children's development may have been enhanced. Perhaps with more longitudinal study, the children's contributions to the improved interaction quality may become more apparent. Further, the ANOVA results, which revealed that the difference between groups was sustained up to 7 weeks post-intervention, support Barnard's (1995) contention that

> improving the parent-child interaction is tapping a reoccurring process that recycles over and over, so that when a positive gain is established in the parent's behavior it is likely to renew itself due to the child's responsiveness to the behavioral act" (p. 1)

Changes in Measurement

The VEXP shows promise as an approach for assessing infants' attentiveness and responsiveness. Prior to its use in this study, the VEXP was in the process of development for description of infants' abilities to anticipate events in their environment. This pilot study suggests that, once technical difficulties are resolved, the VEXP has considerable potential for examining the effects of interventions on the caregiving environment and early cognitive development. Recommendations arising from this study could help overcome the reliability problems associated with data coding. The difficulty of obtaining reliable judgements of eye movements suggests that the more objective scoring used by Haith and colleagues needs to be adapted to videotape technology.

One recommendation would be to isolate videotape frames on line with computer projection. Then a mouse point can localize the centre of the infant's pupil relative to markers in the X and Y planes. The coordinates can then be digitized and coded with new PC hardware and software so that objective numeric criterion are defined for visual reactions to stimuli. This method would eliminate the type of error introduced in the pilot such as the problem of videotape "stretching" as it is replayed over and over and subjectivity in judgments of eye movements.

The difficulty of obtaining reliable judgements of eye movements suggests that the VEXP technique, as utilized in this study, cannot be depended on to register true differences between groups, due to the inflated standard error of estimates (Cook & Campbell, 1979). Nonetheless, the VEXP data, based on an experimental pilot technique, were consistent with the MDI data, based on a more conventional measure of cognitive development. Further, despite the small sample size and one case of low reliability of measurement, there was overall consistency in the pattern of results. Across multiple sample sizes, observers, data coders, testing sessions, types of analysis, and instruments, significant differences between groups were repeatedly found. However, conclusions that the program was effective must remain tentative until a full trial is completed.

It is important to emphasize the promise of the results found in this pilot study.

The next task will be to confirm these results in a full trial. The full trial could include longer-term follow-up as well as some socially relevant outcomes, such as the incidence of behavioural problems, school readiness, and peer competence.

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MANUSCRIPT THREE

FROM NURSING INTERVENTION TO RESEARCH PROTOCOL IN FIVE STEPS[3]

Abstract

An essential first step in conducting research about clinical nursing interventions is the development of a research protocol. A vital requirement for any research project is a detailed plan for the provision of a specific experimental construct or research design. However, the conversion of intervention programs into research protocols has been described as difficult at best. Five steps are outlined to facilitate the conversion of interventions into research protocols: (1) Identification; (2) Development; (3) Content Validation; (4) Testing; and (5) Adaptation. Throughout the process, important questions are posed that provide guidance to the researcher or clinician in detailing the research protocol. The conversion of the Keys to Caregiving program into a research protocol is used as an example.

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[3] A version of this chapter has been submitted for publication.

FROM NURSING INTERVENTION TO RESEARCH PROTOCOL IN FIVE STEPS

Ideally, evidence derived from research should determine clinical practice. Some clinical nursing interventions, however, have been developed without research. Before existing nursing interventions can be assessed, they must be transformed into research protocols (Polit & Hungler, 1987). Research protocols detail the plan for the delivery and evaluation of clinical interventions (Schuch, 1994). Further, by explicitly describing the intervention, others may evaluate and/or replicate the protocol. Evaluation and replication are essential components of evidence-based clinical practice.

In spite of the vital role of research protocols in evidence-based practice, scant literature has been identified on how to develop them. At best, the process has been described as difficult (Jairath & Fitch, 1994; Kirchhoff, 1993). The purpose of this paper, then, is to detail the process of converting an existing clinical nursing intervention program into a research protocol. The process consists of five steps:

- identification
- development
- content validation
- testing, and
- adaptation.

The Keys to Caregiving program (NCAST, 1990) will be used as illustrative example at each stage.

Identification: The First Step

In spite of the dearth of nursing research articles that cover every conceivable aspect of human health, many nursing interventions remain in need of testing. There are several possible reasons for this lack of emphasis. It may be that the exciting possibilities raised by the suggestion of descriptive and correlational data preempts rigorous testing of nursing interventions. Or that the traditional interventions frequently seem to be working well enough without the benefit of testing. These are the very areas in which to look for nursing interventions in need of testing. A good beginning is to examine nursing interventions that are used in everyday practice by reviewing the literature. If there is not adequate support for an intervention's use in practice, then an intervention in need of testing has been identified. Alternatively, new nursing interventions may be identified that have limited literature on their efficacy. This is another excellent place to begin.

> *The Keys to Caregiving program (NCAST, 1990) was identified as a clinical nursing intervention that has not been extensively evaluated. Due to years of descriptive and correlational data that emphasized the importance of parent-infant interaction to children's health, it was introduced to a very enthusiastic audience. It teaches both professionals and parents about newborn behaviour and appropriate, responsive care for infants (Sumner, 1995). Descriptive research on its use by pediatric and maternal-newborn nurses in hospitals has been documented (Jensen, 1993; Leitch, 1995; Wesolowski, 1994). As well, preliminary evaluative work has been conducted. The effectiveness of the program with adolescent mothers in the immediate post-partum period has been studied (Loan, 1992) as has the program in combination with other interventions for socially disadvantaged mothers (Smith, 1991). Both studies suggested promising results. It was decided that the program would be evaluated in*

isolation and its effectiveness with adolescents over the long-term would be examined.

Development: The Second Step

Once a nursing intervention has been identified for evaluation, the intervention has to be developed into a beginning research protocol. Several questions must be answered in this stage.

1. What is the intervention?

This is the starting point for the development of the protocol. The research protocol must look like the intervention on paper and must feel like the intervention when in use. Otherwise the clinical relevance of the research protocol may be questioned.

Keys to Caregiving consists of a self-instructional video series and a manual for teaching nurses and other health-care professionals about six topics--infant states, infant behaviours, infant cues, modulating states, the feeding interaction, and nurse-parent communication. The program was designed for health-care professionals who are responsible for providing the information, in the form of pamphlets and patient teaching, to newly post-partum mothers, usually in hospital.

2. How can the intervention be used in practice or how is it being used?

The answer to this question will provide the guidance necessary to ensure that the protocol matches the intent of the intervention. Several decisions must be made about the scope of the intervention (whether short or long-term), the setting, and for whom the research protocol is written.

Due to the current practice of short post-partum hospital stays, the research protocol was developed for home visitation. A systematic, six-week intervention program was designed for interventionists to follow in their work with the families. The research protocol introduced a different topic for each of five weekly visits, from infant states to the feeding interaction. A sixth unstructured visit was planned for review and debriefing. The research protocol manual outlined the intervention program composed of video vignettes, pamphlets, key idea sheets, appropriately organized discussion, and teaching strategies.

3. Who is the target of the intervention?

This consideration will help to ensure that all aspects of the research protocol address the needs or characteristics of the target population.

The research protocol was developed for adolescent parents. As a result, a section entitled "Development in Childbearing Teenagers" was added to facilitate the interventionists' abilities to address the particular needs of adolescent parents. Consideration was also given to the developmental tasks of adolescence and motherhood and the impact on the adolescent mother (Mercer, 1979). Further, the teaching strategies outlined in the Keys to Caregiving program were examined and deemed to be consistent with successful teaching strategies for adolescents described in the literature (Bachman, 1993; Drake, 1996; Mercer, 1979; Moore, Erikson, & Wurgel, 1984; Whitman, Graham, Gleit, & Boyd, 1986).

4. What guidance needs to be given to interventionists using the research protocol?

This important consideration provides the interventionists with the information necessary to successfully implement the independent variable. Clarity is essential to success.

> *The research protocol was designed to guide interventionists in the progress of their home visits, not to replace the learning they received as part of training in the Keys to Caregiving program. As a result, the content of the research protocol was similar to content in the Keys to Caregiving self-instructional manual with the elimination of such sections as the program overview, study guide overview, directions for the learner, and the self-testing sections. Only material deemed necessary to be conveyed to the adolescent mothers was retained. As well, several sections were added to promote clarity of the research protocol. First, a section entitled "Preamble" was added that provided general guidelines on manual content, when and how to introduce topics, and how to conduct the sessions. Second, a section called "Program Schedule" was provided for each home visit, with the exception of the "Review" visit, with more specific suggestions about how to conduct the visits. Throughout, important concepts were italicized.*

The answers to all of these questions will help ensure that the research protocol is carefully developed to meet the exact needs of the intervention test. See Table 4-1 for an outline of the newly developed research protocol example.

Content Validation: The Third Step

After the initial development phase, an important step before testing the research protocol is evaluation for content validity. Expert judgements are used to assess both the degree to which the research protocol is representative of the intervention, and the relative importance of various parts of the intervention (American Educational Research Association, 1990). Suggestions can be considered and errors or omissions can then be corrected before testing.

The research protocol manual was evaluated by a panel of doctorally-prepared experts in early intervention and child development for face validity. It was determined to be conceptually consistent with the aims of the intervention program being tested and the needs of adolescent parents.

Testing: The Fourth Step

The research protocol is now ready for pilot testing. Several measures can be taken to assess the protocol's adequacy. First, the interventionists using the protocol must have a large amount of input into the usefulness and clarity of the protocol. An essential part of the testing is detailing the quality of the interventionists' progress through the protocol. Measures such as note-taking and recording of intervention procedures can be undertaken. Second, where possible, the subjects must have an opportunity to provide qualitative and/or quantitative feedback. Ideally, this process can be embedded in to a larger pilot test.

The protocol was tested through 60 home visits to adolescent mothers and infants as part of a pilot study. In the protocol manual, ample room was provided for the interventionist to make notes following each home visit. Noted, for example, were teaching strategies that worked and how the research protocol succeeded in guiding each visit. A very important consideration was related to the timing of the information needs that arose during the home visits. It was possible that this *would affect the order in which the Keys to Caregiving material was covered in the six week program. In addition, audiotapes were made of randomly selected home visits. Additional detail about approach strategies that worked and the progress of visits were gleaned from these audiotapes. Finally, when adolescent mothers completed the six-week research protocol, they were asked "What would you change if you could design this program?" Responses were recorded and taken into consideration in the adaptation of the research protocol manual.*

Adaptation: The Fifth Step

After the testing phase, the data gathered from the interventionists' and subjects' feedback is carefully scrutinized for potential changes that will improve the research protocol. Two questions need to be addressed to ensure that the research protocol remains true to the intent of the clinical nursing intervention, as the independent variable being operationalized.

1. What structural changes need to be made?

These changes will help enhance both the clarity and "user-friendliness" of the protocol.

> *First, an introductory "Preface" was added that explained the importance of the intervention program for the target population. It was a one page statement designed to clarify the problem and to foster the interventionists' commitment to being part of the solution. Second, the original "Preamble" section was elaborated and retitled "Intervention Manual Guidelines". In it, an introduction and overview of the manual content was provided, as was a more detailed outline of how each session should proceed. Third, the section entitled "Program*

Schedule" was found to be awkwardly positioned in the manual, reducing the ease with which it was utilized. As a result, program schedules were integrated into the sections covering the content for each weekly visit. An additional change was the addition of a section that structured the final "Review" visit.

2. Second, what content changes need to be made?

These changes address specific research protocol guidelines, task procedures, information-giving strategies, and the like.

First, sections were added that described specific teaching and learning strategies that were noted as useful. These augmented the teaching strategies outlined in the Keys to Caregiving program. Second, it was noted during the home visits that the younger mothers initially had more difficulty adjusting to the demands of motherhood. As a result, literature on teenagers' adjustment to parenting was elaborated to include information on maternal role attainment from Mercer (1995). Third, it was found to be helpful to provide the adolescent mothers with the rationale for the behaviours being advocated. So, the results of research that correspond to the behaviours advocated in the Keys to Caregiving program were added. Fourth, subjects frequently wanted to learn the information that was to be covered at a later stage in the program. Clear "Intervention Manual Guidelines" were provided to ensure that subjects' individual needs were met in a timely fashion, while maintaining the program schedule. In particular, it was noted that one topic was always covered earlier than planned in the protocol, and as a result, it was moved. "Session 4: State Modulation" was *moved into the second week of the program with "Session 2: Infant Behavior". This decreased the number of home visits that subjects would receive. Finally, subjects' comments in response to the question "What would you change if you could design this program?"were taken into consideration. Several suggested that the program could be shortened and that the "State Modulation" content should be introduced sooner. These comments provided validity to the content changes.*

The final outline for the adapted research protocol is described in Table 4-1.

Table 4-1

The Research Protocol from Development to Adaptation

Step Two: Development	Step Five: Adaptation
Preamble	Preface
Program Schedule	Intervention Manual Guidelines
Development in Childbearing Teenagers	Development in Childbearing Teenagers
Session 1: Infant States	Session 1: Infant States
Session 2: Infant Behavior	Session 2: State Modulation & Infant Behavior
Session 3: Infant Cues	Session 3: Infant Cues
Session 4: State Modulation	Session 4: Feeding is More Than Just Eating
Session 5: Feeding is More than Just Eating	Session 5: Review

Conclusion

The identification, development, validation, testing, and adaptation steps of converting a clinical nursing intervention into a research protocol has been described. Ideally, the nature of the independent variable is neatly captured in a well-operationalized research protocol. However, ongoing evaluation remains necessary.

Ongoing testing and potential adaptation of the research protocol are planned as part of the larger study to follow from the pilot. Again, interventionists will be *encouraged to record the progress of visits and insights into what works for the adolescent. As well, subjects will again be asked for their opinion about potential changes to the program.*

As the first and perhaps most important step in the process of evidence-based practice, research protocols need to be clear and concise in order to be relevant to clinicians and researchers. Carefully planned research protocols can enhance evidence-based practice by being readily evaluated and replicated for use.

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MANUSCRIPT FOUR

ATTRITION AMONG ADOLESCENTS INVOLVED IN A PARENTING INTERVENTION[4]

Abstract

Subject attrition poses problems for the successful implementation and testing of interventions for adolescent parents. The purpose of this paper was to identify factors related to adolescent mothers' attrition in an effort to prevent problems with retention in future studies. We assessed attrition that occurred in a randomized trial of a parenting intervention program for adolescent mothers and their infants. Infants who were admitted to the neonatal intensive care unit, mothers who had difficulties with a partner, and mothers and infants who were visited for less than 60 minutes a week on average (typically in the control group) were all statistically significantly more likely to miss one of the two follow-up visits. Stress and being in the control group were the key factors that influenced attrition and provide direction to potential solutions to the problem.

Key words: adolescent mothers, attrition, clinical trial, interventions

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[4] A version of this chapter has been submitted for publication.

ATTRITION AMONG ADOLESCENTS INVOLVED IN A PARENTING INTERVENTION

Attrition, characterized by subjects dropping out of studies, can threaten internal and external validity and may introduce bias to study findings[1, 2]. Due to the combined stresses of adolescence and early parenthood, adolescent parents are at particular risk for dropping out of studies. Although adolescent parents frequently require intervention programs to assist them with parenting[3,4], attrition in this population challenges the efficient testing of such programs. For example, O'Sullivan and Jacobsen[5] observed attrition rates of 60% for the intervention group and 82% for the control group in a randomized trial of a health care program for adolescents and their infants. Osofsky, Culp and Ware[6] noted that adolescents who failed to participate fully in an intervention program were typically younger than 16 years of age, had smaller infants, and infants with shorter gestational ages than adolescents who fully participated. The purpose of this paper was to examine factors associated with adolescent mothers' attrition.

Methods

Adolescent mothers were approached in hospital within the first week postpartum and asked if they would participate in a study. They were told the purpose of the study was to determine which of two programs worked best for teenage mothers. The programs were described as having been designed to make parenting a little easier and to help their infants' development and health. They were told that, regardless of the program to which they were randomly assigned, they would receive weekly home visits by a registered nurse for six weeks. As well they were informed that transportation would be provided for return visits to the hospital (at 7 to 9 weeks and 11 to 13 weeks) for follow-up assessment. Mothers were unaware that one of the programs involved the intensive structured intervention program being tested, while the other program served as a control. Subjects in both programs received incidental teaching related to infant health or mothers' postpartum concerns.

For the purposes of assessing attrition, data were collected on wide-ranging maternal and infant characteristics for those who agreed to participate. Ethically, data were unable to be collected on those who refused to participate at the outset. Data were analysed with appropriate Chi-Square, Phi or Wilcoxin-Mann-Whitney tests. The twenty-four participating subjects were 15 to 19 years of age, first-time inexperienced primary caregivers, and had an uneventful postpartum recovery. Their eligible infants were healthy singleton births of between 37 and 41 weeks gestation, weighing between 2590 and 3960 grams at birth, and discharged into mothers' care by 8 days of age. When subjects completed the three months of study or elected to drop out of the study, they were asked specific debriefing questions: "What enabled or encouraged you to remain in the study?", or "Why were you unable to complete some portion of the program?" and "What would have prevented you from dropping out?". Responses were recorded for content analysis. The investigator reviewed the responses for each question and each response was written on an index card. Responses were then sorted into categories by the investigator, then a second coder resorted the cards into the categories identified by the investigator[7]. Percentage of agreement ranged from 87% (27/31 responses) to 100% (16/16 and 12/12). More extensive details of the methods can be found in Letourneau[8].

Results

In all, 12 subjects completed all aspects of the parenting programs and follow-up assessments (50% of those enrolled). Six (25%) dropped out before the evaluation phase of the study and another six (25%) attended only one of the two follow-up visits for assessment. Although limited data were available, comparisons were undertaken between those who dropped out before the evaluation phase (n=6), those who were unable to attend one of the two evaluation visits (n=6) and those who completed all aspects of the evaluation (n=12). No statistically significant differences were found with the available data; however, this is likely due to the scant data collected for the early drop outs. Comparisons were then made among those who completed all aspects of the evaluation (n=12) with those who were unable to attend one of the two follow-up visits (n=6).

First, the infants who were admitted (even briefly) to the neonatal intensive care unit (NICU) were less likely to complete the study (ϕ=.500, p=.034) and second, mothers who were observed to experience difficulty with a partner over the course of the study were more likely to drop out (ϕ=.614, p=.009). Finally, subjects who were visited for an average of less than 60 minutes per home visit were more likely to drop out (ϕ=.553, p=.019) and typically these subjects were in the control group. When home visit lengths were compared, the intervention subjects' mean was 73 minutes while control subjects' was 43 minutes in length (t=5.73, p=.000). The lack of an intervention during the home visit rather than the length of the visit is likely the factor leading to attrition.

In answer to the question "What enabled or encouraged you to remain in the study?", subjects reported that they found the program information interesting (n=9), or helpful (n=6). Others appreciated having "someone to talk to" or having the nurse-interventionist telephone and visit weekly (n=6). One mother reported that the frequent contacts were the only reason she was able to complete all that she did. Learning about how her baby was doing (n=4), how she was doing as a mother (n=3), and curiosity about what the study was all about maintained other mothers' involvement (n=2).

The twelve subjects who dropped out or were unable to complete one of the two evaluation follow-up visits answered the question "Why were you unable to complete some portion of the program?". "Not enough time" or "bad timing" was the most frequent reason given (n=7). Stress was another reason cited, whether related to problems with partners (n=2), an illness (n=2), or to fatigue (n=1). Mothers also cited moving homes or simply moving away as a reason for being unable to complete the program (n=4). In answer to the question "What would have prevented you from dropping out?", most of the twelve stated that the nurse-interventionist could have done nothing (n=7). However, others suggested that the nurse could have had more flexibility in requiring that the subjects be seen in certain weeks (n=3), conducting visits outside of the home (n=1), or collecting data in the mothers' homes rather than in the office (n=1).

Discussion/Conclusions

The key factors associated with dropping out of this study were related to parenting daily hassles or to not receiving the intervention. Those who dropped out faced stress from having an infant who was not well at birth, insufficient time to participate, problems with partners, moving to a new place of residence, and maternal illness. It may be possible for researchers to find solutions to these social or health problems and the results provide some indication of those at risk for not completing studies. This information may be useful for extending the exclusion criteria, by for example, only approaching mothers of infants who were not admitted to NICU or excluding partnered mothers. In contrast, although potentially adding to the expense of studies, supports may be provided to these groups to facilitate their continued participation.

Other measures that may be taken to reduce daily hassles and stress are related to increasing the convenience of participation. Providing transportation, scheduling visits around subjects' time demands, remaining flexible about rescheduling visits, and persistence in attempting to schedule visits is paramount. As well, the research protocol may be adapted to collect as much data as possible in subjects' homes, rather than requiring subjects to travel.

The second factor was related to the no-intervention control condition. Those who were seen for less than 60 minutes more often dropped out and were typically in the control group. A possible solution to this problem is found in the subjects' reports that the interesting program information was their principal reason for staying in the study. Both intervention and control families must believe that they are gaining something valuable from their ongoing participation. Control group subjects can receive a beneficial program that is distinct from the intervention, beyond simple access to nurses for incidental health teaching.

An alternative explanation to the relationship between shorter visits and dropping out gives rise to the final possible solution to the attrition problem. It may be that the mothers who eventually dropped out gave potent signals to the visiting nurse indicating that they were stressed, busy, or disinterested. This may have induced the nurse to leave sooner than she might have otherwise. As a result, it may be advisable to bear the expense of enrolling more participants at risk for attrition to prevent compromising the representativeness of study samples.

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MANUSCRIPT FIVE

PROMOTING CHILD DEVELOPMENT VIA PARENT-INFANT INTERACTION[5]

Abstract

Due to the many stresses associated with both adolescence and parenting, children of adolescents are frequently at risk for not fulfilling their full developmental potentials. This is a disturbing trend as healthy child development has been identified as one of the key determinants of health and resiliency in adulthood. We pilot tested an intervention program designed to promote optimal parent-infant interaction in an effort to affect the social and cognitive development of children of adolescent mothers. The intervention produced promising results that provide direction for nurses working with young families. The intervention involved education that can be integrated with extant programs to help young, at-risk families such as adolescents and their infants. Hence, nurses may be best positioned to help support the healthy development and resilience of Canada's youth through promoting optimal parent-infant interaction.

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[5] A version of this chapter has been submitted for publication.

PROMOTING CHILD DEVELOPMENT VIA PARENT-INFANT INTERACTION

Each year in Canada, approximately 25,000 infants are born to adolescent mothers.[1] The combined stresses of both adolescence and parenting frequently place adolescents' children at risk for not fulfilling their full developmental potentials. Recently, healthy child development has become recognized as a key determinant of health by several Canadian organizations and as an important protective factor in the promotion of resiliency.[2] Resiliency in children is characterized by an ability to cope successfully in the face of significant adversity or risk.[3] Promoting child development among children of adolescents appears essential to maintaining their health and resiliency. The purpose of this paper is to describe the results and nursing implications of a study designed to promote healthy child development among infants born to adolescents.

Adolescent parents experience many stresses that can influence parenting. They are less likely to complete their schooling and more likely to live in poverty.[4] The upheavals of adolescent development in combination with the demands of early motherhood may lessen mothers' emotional availability to their infants, with potential consequences for parent-infant interactions.[5] Further, when compared to older or more educated mothers, adolescent mothers have been found to be less sensitive, less verbal, and less responsive to their infants.[6] As well, they often lack knowledge of normal infant development, have unrealistic expectations of infant behaviour, and are prone to impatience and to use physical punishment.[7]

The children of adolescents consistently have been found to exhibit deficits in cognitive development and to perform less well in school than children of older or more educated mothers.[8] They also have more behavioural problems, fewer social skills, and more troubled peer relationships than children of older mothers.[9] These outcomes are likely related to the quality of parent-infant interaction between adolescents and their infants.

High quality parent-infant interactions are characterized by mutual warmth, sensitivity, and responsiveness.[10] When infants are reared in a warm, sensitive, and responsive caregiving environment, they are more likely to use their parents as a secure base from which to explore and learn from their environments, thereby fostering continued successful cognitive and social skill development.[11] According to Barnard[12], promoting parent-infant interaction has the potential for enduring effects because it taps "a reoccurring process that recycles itself over and over, so that when a positive gain is established in the parent's behaviour it is likely to renew itself, due to the child's responsiveness to the behavioural act"[p1]. This process has also been charged with setting in motion a protective mechanism that can promote resilience.[13]

Nursing strategies that foster high quality parent-infant interactions may improve children's healthy development and resiliency. To test this assertion, an existing nursing intervention program (Keys to Caregiving) designed to improve the quality of interaction between parents and their newborn infants was tested.[14] It was adapted for home visitation of adolescent parents and infants. Using a variety of modalities, parents were facilitated to learn about *Infant States, Infant Behaviours, Infant Cues, State Modulation,* and the importance of *The Feeding Interaction* (Table 6-1).

Methods

A two-group design was utilized with random assignment of adolescent mother-infant pairs to either the intervention program (designed to improve the quality of parent-infant interaction) or the comparison program. Twenty-four adolescents and their babies were recruited from a hospital postpartum unit and eighteen pairs completed the study. Adolescents were between 15 and 19 years of age with between eight and 12 years of education, while their infants were between 2590 and 3960 grams and 37 to 41 weeks gestation at birth. All mothers reported that they were the major caregivers for their infants (the person who spent the most waking hours with their infant) and 50% were partnered. All parents and infants were discharged by the eighth postpartum day without need for extensive medical or nursing follow-up care.

Both the intervention and comparison groups received six weekly home visits from a registered nurse. The intervention group were exposed to Keys to Caregiving, the educational program designed to improve the quality of parent-infant interaction. The comparison group received only incidental teaching in response to mothers' remarks about infant wellness or postpartum concerns. Both groups returned to the hospital for assessment at 7 to 9 weeks and 11 to 13 weeks postpartum. Follow-up assessment consisted of observations of feeding and teaching interactions with the Nursing Child Assessment Feeding and Teaching Scales at both assessment time points.[15] As well, the infants' cognitive ability was assessed with the Bayley Scales of Infant Development II Mental Development Index and the Visual Expectation Paradigm Test[16] at the 11 to 13 week assessment time point. Extensive reliability and validity data exist on the Feeding and Teaching Scales and on the Bayley Index, and promising predictive validity data exist on the Visual Expectation Test. Details of the study methods and instruments can be found elsewhere.[17]

Table 6-1

Keys to Caregiving Content

Infant States	Parents are taught how to read and respond to the newborn's six levels of consciousness. Most importantly, parents learn that infants interact best in the quiet alert state.
Infant Behaviour	Parents are taught about normal infant behaviour, for example how infants can habituate to stimuli during sleep and that newborns can see, hear, and respond to play.
Infant Cues	Parents are taught about infants' nonverbal cues and to identify infants' cues that signal a desire to interact (engage) or to have a break (disengage) from an interaction.
State Modulation	This information builds on the knowledge gained from Infant States. Parents are taught how to alert a sleepy infant for feeding or playing and how to soothe a fussy infant.
The Feeding Interaction	Parents are taught to recognize hunger and satiation cues and to make the most of feeding interactions by talking, touching, and showing enjoyment during feedings.

Results

The intervention program led to significant improvements in the quality of adolescents' interactions with their infants. The intervention group mothers had better quality interactions with their children than the comparison group mothers during normal infant feedings. When mothers were asked to teach their child a simple task such as to shake a rattle or squeeze a squeak toy, the intervention group had better quality interactions with their children than the comparison group during the teaching sessions.

Overall, the intervention group was more contingently responsive to their infants than the comparison group. In other words, parents and infants in the intervention group responded more quickly and appropriately to one another. For example, when intervention infants verbalized, their mothers were more likely to verbalize back or make a gesture in response. These changes represented an average improvement of 11% (range 5% to 16%) in overall performance on the Feeding and Teaching Scales. As well, the intervention group infants showed significantly improved cognitive ability over the comparison group. They had both higher cognitive development quotients (by 8 points on average) on the Bayley Scales and they responded more quickly to the appearance of regularly appearing visual pictures on the Visual Expectation Test. This may suggest that the infants had an improved ability to detect patterns of environmental stimuli, an ability that is believed to be related to the quality of contingent responsiveness in parenting.[18]

Recommendations

This nursing intervention had a positive effect on a sample of adolescents and their infants compared to those who did not receive the program. Because the effect was maintained for up to seven weeks after the intervention, a reoccurring social process may have been put in motion, fostering optimal development in the children. A more extensive study with longer term follow-up will offer the opportunity to further assess these preliminary results; however, several interim recommendations arise for nurses in various settings.

- **Nurses in Practice**

Public health nurses, with their long history of community care for families, are well prepared to strengthen existing programs and are encouraged to implement new programs for young families. Support for this recommendation is found in the National Forum on Health Final Report's statement that "community-based programs with a home visiting component should be supported and strengthened where they exist and implemented where they do not, to help children develop resiliency and to foster the development of parental competence".[19]

As well, nurses working with young families in any context should be certified to assess and intervene to promote optimal parent-infant interactions for healthy child development and resiliency. Such assessments can provide the data necessary for evidence-based practice that will enable nurses to both better serve clients and to obtain funding for programs.

- **Nurse Educators**

Educational programs that prepare nurses to work with young families should contain content exploring and applying the extensive body of nursing literature and research on parent-infant interaction and early intervention programming.

- **Nurse Researchers**

Research programs need to be supported that develop and test interventions designed to strengthen parent-child relationships, healthy child development, and resiliency. Nursing interventions aimed at improving the quality of nurturant relationships and interactions between parents and children must be examined for their short and long-term efficacy in the promotion of resiliency before widespread use in practice.

- **Nurse Administrators and Policy-Makers**

Finally, as the Canadian Public Health Association pointed out, the "health of the present generation is not to be purchased at the expense of future generations".[20] As a result, the above recommendations need to be supported through appropriately directed resources and funding. Nurses, knowledgeable of the challenges facing young families, are best positioned to ensure that the government fulfills its responsibility to Canada's youth. Lobbying and public relations initiatives will have to be undertaken to gain and maintain funding to support the development of Canada's most valuable resource--it's children.

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GENERAL DISCUSSION AND CONCLUSIONS

To conclude, each of the four objectives of the feasibility study have been achieved. First, the intervention program was examined with respect to the dependent variables of parent-infant interaction quality, contingent responsiveness of the mothers and infants to one another, and infant cognitive development. The results suggest promise and provide support for conducting a full trial of the Keys to Caregiving intervention program. Second, the feasibility of conducting a technique for measuring visual expectations as an aspect of infant cognitive development was assessed. It was deemed a valuable measure and recommendations for refinement with improved technology were posed. Third, a research protocol manual was developed, tested, and adapted for the implementation of the Keys to Caregiving intervention program. This provided evidence that nursing interventions can be converted into research protocols. Finally, the feasibility of conducting the study with the population of adolescent mothers and their infants was assessed. This provided important information about recruitment, attrition, and retention of subjects. These data provide the estimates needed to calculate sample size for the larger trial to follow. As well, information has been gathered about the suitability and feasibility of the measures, the rate and location of missing data, and issues of data analysis.

The following summarizes the modifications or approaches that are recommended for a full trial.

Keys to Caregiving Intervention

- The topic of state modulation will be introduced earlier in the program to meet the needs of new parents in a timely and systematic manner.

- Keys to Caregiving will be tested as a five-week intervention program rather than as a six-week intervention program. This will facilitate time savings for participants and cost-savings for a full trial.

Comparison Group Intervention

- The comparison group intervention will also be provided over five weeks to allow comparisons between it and the Keys to Caregiving intervention.
- An educational intervention program that is unrelated to the Keys to Caregiving intervention may be provided (rather than a "neutral intervention") to help ensure that participants feel they are gaining something valuable from participating. This may function to reduce attrition.

Controlling Attrition and Enhancing Completion of Assessment Sessions

- Enrolling adequate numbers of subjects will help ensure that the sample is representative and that statistical power is maintained.
- Enrolling subjects whose infants are not admitted to NICU will eliminate this readily identifiable variable as a threat to retention.
- Maintaining flexibility in the scheduling of visits will enhance the completion of assessment sessions.
- Conducting as much data collection as possible in subjects' homes will also enhance the likelihood of collecting complete data.

Measures

- It may be possible to conduct the NCAFS and NCATS at both data collection time points in subjects' homes.

- The potential changes to the VEXP technique outlined in Manuscript Two and in Appendix J will be considered and appropriately implemented to reduce difficulties associated with data integrity and subjectivity in data coding.
- The VEXP will be repeated as necessary with infants to ensure that baseline data are obtained. New and improved technology will facilitate this process.

Analyses

- A greater degree of confidence will be gained in the calculation of 2x2 factorial ANOVA tests with larger sample sizes.
- Multivariate ANOVA tests may also be undertaken in a more robust test of the clinical model. The NCAFS and NCATS total scores may be grouped in to dependent variables as may the infant cognition scores obtained on the MDI and VEXP. Nonetheless, univariate ANOVAs and perhaps independent t-tests will be conducted to determine the more precise nature of effects.

Sample Size

- The assessment of attrition rates in this feasibility study allows for the projection of optimal sample size in a full trial.
- The group differences assessed by the NCAFS and NCATS measures of total parent-infant interaction scores can be used to determine the effect size in this sample (Mean Difference/Pooled Standard Deviation) (Cohen, 1988; Rudy & Kerr, 1991). This effect size will be used in the calculation of sample size for a full trial.

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Appendix A

Table A-1

Timing of Administration of Instruments or Tests

	Pre-Intervention	7-9 Weeks	11-13 Weeks
Hollingshead Four-Factor Index of Socioeconomic Status (SES)	✓		✓*
Edinborough Postpartum Depression Scale (EPDS)		✓	✓
Difficult Life Circumstances Scale (DLC)	✓		✓
Nursing Child Assessment Satellite Training Feeding Scale (NCAFS)		✓	✓
Nursing Child Assessment Satellite Training Teaching Scale (NCATS)		✓	✓
Visual Expectation Paradigm test (VEXP)			✓
Bayley Scales of Mental Development II Mental Development Index (MDI)			✓

*Hollingshead SES recalculated at 11-13 weeks only if change in status observed or reported in response to questioning.

Appendix B

Table B-1

Psychometric Properties of Selected Study Instruments

		Reliability		Validity	
	Purpose	**Test-Retest**	**Internal Consistency**	**Concurrent**	**Construct**
Difficult Life Circumstances Scale (DLC) (Barnard, 1989)	To assess the severity of life stresses.	r=.40-.70	not available	r=-.39 with MDI, r=-.23 with Secure Attachment, r=-.44 with Language Scale, r=.21 with number of childhood illnesses	These correlations are all consistent with a high DLC score being associated with poor child outcomes across physical, emotional, and cognitive domains.
Edinburgh Postpartum Depression Scale (EPDS) (Cox, Holden, & Sagovsky, 1987)	To assess the existence of postpartum depression.	not available.	alpha=.87	r=.68 with Beck Depression Inventory	Sensitivity: identified 86-95% of true positives (depressed), and 78%-93% of true negatives.
Nursing Child Assessment Feeding Scale (NCAFS) (Sumner & Spietz, 1995a)	To assess social interaction between parents and infants during feeding.	r=.75 for total parent score, r=.51 for total infant score	alpha=.83 for total parent, alpha=.73 total infant, alpha=..86 total score, alpha=.73 for contingency	r=.47 with NCATS for the total parent scores, r=. 29 for the total infant scores, r=.54 with total Home Observation for Measurement of the Environment (HOME), r=.39 with MDI at 3 months	Identified substance abusing, and abusive mothers, as well as multi-problem families.
Nursing Child Assessment Teaching Scale (NCATS) (Sumner & Spietz, 1995b)	To assess social interaction between parents and infants during teaching.	r=.85 for total parent score, r=.55 for total infant score	alpha=.87 for total parent, alpha=.81 for total infant, alpha=.87 for total score, alpha=.82 for contingency	r=.44 with total HOME, r=.30 with MDI at 3 months	Identified substance abusing mothers, and discriminated between term and preterm infants.
Bayley Mental Development Index (MDI) (Bayley, 1993)	To assess infant cognitive development.	r=.83 for ages 1 and 12 months	alpha=.83 for 3 month old test items	r=..59-.77 between MDI and Weschler, r=.79 between MDI and General Cognitive Index	These correlations are consistent with the MDI measuring cognition. Identified delays.

Appendix C

Reliability and Validity of the VEXP

Table C-1

Split-Half Reliabilities for VEXP Measures (Columbo, 1993)

Study	Age	Retest Interval	Infant Reaction Time	% Anticipations
Haith & McCarty (1990)	3	zero	+.58	+.52
Arehart & Haith (1990)	3	zero	+.73	+.72
Canfield (1991)	4 6	zero zero	+.42 +.87	-
Jacobson et al. (1992)	6.5	zero	+.53	-
Median reliability:			+.58	+.52

Table C-2

Cross-Section and Cross-Age Stabilities for VEXP Measures (Columbo, 1993)

Study	Age	Retest Interval	Infant Reaction Time	% Anticipations
Haith & McCarty (1990)	3	4-7 days	+.48	+.34
Arehart & Haith (1990)	3	day	+.44	+.73
McCarty & Haith (1989)	3	day	+.71	+.13
Canfield (1991)	4	2 mos.	+.61	+.41
Median Stability			+.55	+.38

Table C-3

Predictive Validity of VEXP Measures

Study	**Ages**	**Stanford-Binet**	**Midparent IQ**[a]	**Wechsler**	**Childhood Postbaseline RT**[b]
DiLalla et al. (1990)	8 mos.- 4 yrs.	-.47 with Infant Baseline RT	-.17 with Infant Baseline RT		
Benson, Cherny, Haith, & Fulker (1993)	8 mos. midparent		-.28 with Infant Baseline RT -.37 with % Anticipations		
Dougherty & Haith (1997)	4 mos. - 4 yrs.			-.44 with Infant Postbaseline RT -.46 with % Anticipations	.51 with Infant Postbaseline RT

[a] the average IQ of the parents

[b] Reaction Time

The negative correlations reflect the following relationship: As RT decreases, IQ increases.

Appendix D

Results of Analysis of Dependent Variables

Table D-1

Independent Samples t-tests on NCAFS Variables

Dependent Variable	Intervention Mean	Control Mean	t-value	Confidence Interval	n	p
Total 7-9 weeks	64.6(3.65)	57.4(6.55)	2.57	1.16, 13.2	15	.012
Parent 7-9 weeks	44.9(2.55)	39.3(5.92)	2.32	-.378, 10.8	15	.019
Infant 7-9 weeks	19.7(1.60)	18.1(2.80)	1.32	-1.01, 4.19	15	.105
Contingency 7-9 weeks	15.6(1.13)	12.8(2.66)	2.60	.476, 5.17	15	.011[a]
Total 11-13 weeks	60.9(4.85)	56.8(4.86)	1.70	1.08, 9.33	16	.056
Parent 11-13 weeks	42.9(2.23)	37.9(2.85)	3.91	2.26, 7.75	16	.001
Infant 11-13 weeks	18.0(3.34)	18.9(2.59)	-0.59	-4.08, 2.33	16	.284
Contingency 11-13 weeks	13.6(2.00)	11.9(2.17)	1.68	-.484, 3.98	16	.058

[a] Assumption of equality of variance violated. Wilcoxin-Mann-Whitney test reveals $z=-2.16$, $p=.031$.

Standard deviations in parentheses.

Table D-2

Independent Samples t-tests on NCATS Variables

Dependent Variable	Intervention Mean	Control Mean	t-value	Confidence Interval	n	p
Total 7-9 weeks	51.6(6.50)	46.5(9.30)	1.20	-4.02, 14.2	15	.125
Parent 7-9 weeks	37.3(4.82)	32.5(6.63)	1.58	-1.77, 11.3	15	.070
Infant 7-9 weeks	14.3(4.15)	14.0(4.54)	0.13	-4.60, 5.16	15	.451
Contingency 7-9 weeks	22.3(3.30)	18.9(5.06)	1.52	-1.44, 8.26	15	.076
Total 11-13 weeks	55.1(4.49)	46.4(9.15)	2.43	1.02, 16.5	16	.015
Parent 11-13 weeks	37.3(4.53)	31.9(6.29)	1.96	-.501, 11.3	16	.035
Infant 11-13 weeks	17.9(2.53)	14.5(4.00)	2.02	-.215, 6.97	16	.032
Contingency 11-13 weeks	21.9(2.36)	18.9(3.76)	1.91	-.364, 6.36	16	.038

Standard deviations in parentheses.

Table D-3

Wilcoxin-Mann-Whitney Tests on MDI Variables

Dependent Variable	Intervention Mean	Control Mean	z-value	n	p
IQ Score	106(9.56)	98.4(3.96)	2.01	15	.033
Raw Score	36.6(4.78)	32.7(1.98)	-1.67	15	.047

Standard deviations in parentheses.

Table D-4

Independent Samples t-tests or Wilçoxin-Mann-Whitney Tests on VEXP Variables

Dependent Variable	Intervention Mean	Control Mean	t- or z-value	Confidence Interval	n	p
Postbaseline Median RT	-.080(.217)	.124(.114)	t=-2.22	-.402, -.006	15	.023
Percent Anticipations (≤200ms)	.657(.168)	.524(.117)	t=1.75	-.031, .297	15	.052
Percent Fast Reactions (201-301ms)	.057(.042)	.115(.133)	z=-.929	not applicable	15	.177
Percent Slow Reactions (>450ms)	.138(.103)	.166(.087)	t=-.580	-.136, .078	15	.287

Table D-5

Two-Way (Repeated Measures) ANOVA Tests on NCAFS and NCATS Variables (n=13)

Variable	Effect	SS	df	F	p[a]
NCAFS-Total	Group	155	1	4.59	.028
	Age	30.7	1	1.47	.251
	Group x Age	18.2	1	.870	.186
NCAFS-Parent[b]	Group	201	1	10.2	.004
	Age	7.92	1	.690	.422
	Group x Age	2.38	1	.210	.329
NCAFS-Child	Group	3.08	1	.440	.260
	Age	7.42	1	2.07	.178
	Group x Age	7.42	1	2.07	.089
NCAFS-Contingency	Group	40.0	1	6.21	.015
	Age	13.0	1	4.03	.070
	Group x Age	2.20	1	.680	.213
NCATS-Total	Group	344	1	4.66	.027
	Age	125	1	3.25	.099
	Group x Age	.070	1	0	.483
NCATS-Parent	Group	135	1	3.95	.036
	Age	16.9	1	.670	.431
	Group x Age	7.09	1	.280	.304
NCATS-Child	Group	48.0	1	2.50	.071
	Age	49.7	1	4.75	.052
	Group x Age	5.72	1	.550	.238
NCATS-Contingency	Group	81.3	1	3.59	.043
	Age	1.19	1	.130	.723
	Group x Age	2.11	1	.240	.319

[a] Group effects and Group x Age effects are examined with one-tailed tests, due to a predicted improvement in development. Age effects are examined with two-tailed tests.
[b] Assumption of homogeneity of variance violated.

Table D-6

Means of Two-Way (Repeated Measures) ANOVA Variables by Group and Age

Variable	Group	7-9 Weeks of Age	11-13 Weeks of Age
NCAFS-Total	Intervention	64.6(3.65)	60.9(4.85)
	Control	57.4(6.55)	56.8(4.86)
NCAFS-Parent	Intervention	44.9(2.55)	42.9(2.23)
	Control	39.3(5.92)	37.9(2.85)
NCAFS-Child	Intervention	19.7(1.60)	18.0(3.34)
	Control	18.1(2.80)	18.9(2.59)
NCAFS-Contingency	Intervention	15.6(1.13)	13.6(2.00)
	Control	12.8(2.66)	11.9(2.17)
NCATS-Total	Intervention	51.6(6.50)	55.1(4.49)
	Control	46.5(9.30)	46.4(9.15)
NCATS-Parent	Intervention	37.3(4.82)	37.3(4.53)
	Control	32.5(6.63)	31.9(6.29)
NCATS-Child	Intervention	14.3(4.15)	17.9(2.53)
	Control	14.0(4.54)	14.5(4.00)
NCATS-Contingency	Intervention	22.3(3.30)	21.9(2.36)
	Control	18.9(5.05)	18.9(3.79)

Standard deviations in parentheses.

Appendix E

Results of Additional Analyses

Table E-1

Results of Additional Demographic Data Analyses

	Mean	SD	Median	Range	n
Hollingshead SES at entry	25.97	7.56	27.50	15.5-36.5	18
Hollingshead SES at 11-13 weeks*	22.5	9.68	19.0	11.0-44.0	16
DLC at entry	2.50	2.18	2.00	0-6.00	18
DLC at 11-13 weeks	3.13	2.78	2.00	0-8.00	16

*Based on original and updated assessments of participants who attended the 11-13 week follow-up visit.

Table E-2

Means in Minutes of Home Visit Time and Independent Samples t-tests of Home Visit Time of Completers versus Drop-Outs

Home Visit	Overall Mean (n=18)	Completer Mean (n=12)	Drop-Out Mean (n=6)	t-value[a]	Confidence Interval[a]	p[a]
One	48.3(21.9)	75.0(28.6)	53.3(14.4)	-2.14[b]	-43.1, -.187	.048
Two	51.4(25.8)	62.1(22.7)	54.2(28.9)	.640	-34.2, 18.4	.532
Three	55.6(27.3)	60.4(28.6)	47.5(11.7)	-1.05	-39.0, 13.2	.310
Four	56.1(24.7)	55.8(27.5)	55.0(29.5)	.060	-30.7, 29.0	.954
Five	59.4(24.4)	56.3(29.9)	41.7(11.3)	-1.14	-41.7, 12.6	.271
Six	67.8(26.5)	46.7(24.4)	51.7(17.2)	.450	-18.8, 28.78	.662

[a] For comparison of completer mean (n=12) with drop-out mean (n=6).

[b] Assumption of equality of variance violated, Wilcoxin-Mann-Whitney test reveals z=-1.53, p=.127.

Standard deviations in parentheses.

Appendix F

Consent Forms

Parents' Consent Form:
Teenage Mothers and Babies Study

Our Reason For Doing This Study:

-We have two programs for teenage mothers. Both are designed to help your baby's development and health. They are also designed to make parenting a little easier.

-We want to figure out which program works best.

The People Who Are Doing This Study:

-Nicole Letourneau is a student doing her PhD in Nursing at the University of Alberta. She is supervised by Dr. Jane Drummond & Dr. Janice Lander also of the Faculty of Nursing.

What Will Happen?

-You will be in one of two groups. One of the groups will take about 18 hours of your time. The other group will take about 12 hours of your time.

-The study lasts until your baby is three months old.

-A fair way will be used to decide your group. It will be like pulling numbers from a hat.

-Each group will have a nurse visit them at home to help them learn about their baby.

-Both groups will have six home visits before their babies are 2 months old.

-Both groups will visit the hospital when their babies are 2 and 3 months old.

-A nurse will videotape you playing with and feeding your baby when your baby is 2 and 3 months old.

-A nurse will also check your baby's mental development when your baby is 3 months old.

-We will also ask you to fill out some forms about your life over the three months.

Are There Any Risks to My Baby and Me?

-There are no known risks from being in this study.

Do We Have To Stay In The Study?

-You do not have to take part in this study. If you decide to join, you and your baby can drop out whenever you wish. Just tell the nurses or us. No one will hold that against you or your baby.

Will Our Privacy Be Kept?

-We will keep your baby's name and what your baby does private. We will also keep your name and what you do private. You will not be named in any articles or talks about this study. We will keep data from this study locked up.

-We may want to show some videotape of you and your baby for teaching other people. If we do, we will ask you for your permission first. If you agree, we will not use your real names.

Questions:

-I am happy to answer any questions now, if you have questions later call me

Nicole Letourneau, RN, (403) 477-4863
or one of my supervisors
Dr. Jane Drummond, RN (403) 492-6410
Dr. Janice Lander, RN (403) 492-6317

I understand the purpose of the study. The risks and benefits of participation have been explained to me. I voluntarily agree to participate in this study.

Signature of Mother **Date**

Signature of Nurse Researcher **Date**

Parents' Consent Form
Use of Videotapes

Nicole Letourneau is a student doing her PhD in Nursing at the University of Alberta. She is supervised by Dr. Jane Drummond & Dr. Janice Lander also of the Faculty of Nursing.
We would like to show some videotape of you and/or your baby to teach others.

Check your choice:

____ I voluntarily give permission to show videotape of me playing with and/or feeding my baby.

____ I voluntarily give permission to show videotape of my baby watching the TV pictures.

Questions:
I am happy to answer any questions now, if you have questions later call me

Nicole Letourneau, RN, (403)492-3032
or one of my supervisors
Dr. Jane Drummond, RN (403)492-6410
Dr. Janice Lander, RN (403)492-6317

I understand that this videotape may be used in teaching others. I also understand that my real name and my baby's real name will not be used.

______________________________ ______________
Signature of Parent **Date**

Appendix G

Revised Research Protocol Manual

Research Protocol for Implementing Keys to Caregiving[1] with Adolescent Mothers and Infants

prepared by

Nicole Letourneau, PhD, RN

University of Alberta
Faculty of Nursing
Edmonton, Alberta

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[1] Adapted from Keys to Caregiving (NCAST, 1990)

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I. Preface

Keys to Caregiving (NCAST, 1990) is a clinical program that "was developed to teach both professionals and parents about newborn behaviour and appropriate, responsive care" in an effort to promote high-quality interactions between new parents and infants (Sumner, 1995, p. 33). High quality parent-infant interactions are characterized by mutual warmth, sensitivity, and responsiveness (Barnard et al., 1989). When infants are reared in a warm, sensitive, and responsive caregiving environment, they are more likely use their parents as a secure base from which to explore their environments (Goldberg, 1990), thereby fostering continued successful development in cognitive ability and social skill (Letourneau, 1997). Indeed, early parent-infant interactive experiences are linked to children's later IQ and may provide the model for later peer interactive relationships (Coates & Lewis, 1984; Schaefer & Edgarton, 1985).

In contrast, parents with a lack of education or experience, such as adolescent parents, are particularly at-risk for less than optimal parent-infant interactions (Censullo, 1994). Adolescent parents are more likely than older mothers to abandon further education (Hayes, 1987) and to live in poverty (Wilkins, Sherman & Best, 1991). Both factors contribute to stresses that may influence parenting. In addition, adolescents' own stage of development may lessen their emotional availability to their infants, with potential consequences for parent-infant interactions (Trad, 1995; Yoos, 1987). With a 10-15% risk of experiencing postpartum depression, itself shown to have a moderate to large effect on the quality of parent-infant interactions (Beck, 1995), many adolescents are doubly at risk for emotional unavailability to their infants. It is not surprising given these risk factors that offspring of adolescents are prone to less than optimal outcomes.

Specifically, children of adolescent mothers consistently have been found to exhibit deficits in cognitive development (Levine, Garcia Coll & Oh, 1985). Beginning in the preschool years and increasing through adolescence, children of adolescent mothers perform less well in school, have more behavioural problems, fewer social skills, and more troubled peer relationships than children of older mothers (Censullo, 1994). The Keys to Caregiving program holds the potential to promote the quality of parent-infant interaction between adolescent parents and infants, thereby ameliorating some of the risks associated with adolescent parenting. As a result of this potential, the Keys to Caregiving program was selected for an experimental test.

An essential first step in conducting research with a clinical intervention program, such as Keys to Caregiving, is the development of a research protocol (Polit & Hungler, 1987). A vital requirement for any research project, the research protocol is a detailed plan for the provision of a specific experimental construct or research design (Schuch, 1994). This manual is the result of an adaptation of the Keys to Caregiving program into a research protocol.

II. Intervention Manual Guidelines

Introduction

This Intervention Manual is designed for you, as a nurse or interventionist, to use in conjunction with the Keys to Caregiving pamphlets. It is assumed that you have undergone the self-instructional Keys to Caregiving program training. In intervening, you will make use of the Keys to Caregiving pamphlets, the Intervention Manual, and the instructive video excerpts[2] from the Keys to Caregiving series. The Nurse ought to be familiar with the content in this manual for each session prior to entering mothers' homes for teaching.

This manual contains information to be dispersed to the teenage mothers that is not included in the Keys to Caregiving pamphlets. Most of the manual content has been adapted directly from the Keys to Caregiving Study Guide; however, useful additions have been made as a result of the pilot test. These additions are usually referenced in the intervention manual and frequently provide rationale for the teaching content. In addition, the manual provides practical teaching strategies for getting the information across to teenagers.

Throughout the manual, the terms "parent" or "mother" are used because it is assumed that the teaching will be done predominantly with the teenage mother. In addition, since this program is designed for teenage mothers, the pronoun she will be used.

Manual Content

There are five sessions:

1. Introduction & Infant States (1-7 days of age)

2. State Modulation & Infant Behaviour (1-2 weeks of age)

3. Infant Cues (2-3 weeks of age)

4. Feeding is More than Just Eating & The Barnard Model (3-4 weeks of age)

5. Review (4-6 weeks of age)

The information to be covered in each session should generally be adhered to; however, if parents ask questions that can be answered by jumping forward in the intervention schedule, please do so. For example, many parents have difficulty waking their infants in the early weeks and often ask questions about this after Session I on Infant States. It is appropriate then, to jump ahead to State Modulation, normally taught at Session 2. Another frequent question parents have relates to the hunger and full cues, normally taught at Session 3. Whenever such questions arise, consider the teaching to be incidental and note it in your manual. The pamphlet to which you jumped ahead should not be given to the parent at that time. Instead the teaching should be verbal in nature. As the intervention schedule is adhered to, the incidental teaching will be reviewed and reinforced.

---

[2] Permission was granted for the use of excerpts from the Keys to Caregiving video series by Georgina Sumner, NCAST Institute, University of Washington, School of Nursing, on April 15, 1996.

Procedure

Prior to each session:

1. Parents are provided with pamphlet(s) to read before the session. It is recommended that only the pamphlet(s) for discussion that week be handed out, not the entire set of pamphlets. Parents may become overwhelmed if all the pamphlets are handed out at the beginning of the sessions.

In each session:

2. Go through the pamphlet(s).
3. While going through each pamphlet, use examples from her own baby to illustrate concepts.
4. Cover the material in this manual, paying close attention to the *italicized* comments.
5. Go through the video excerpts of examples, if necessary. Viewing the video examples is appropriate when the baby does not provide opportunities for adequate demonstration of concepts. For example, a baby that alternates between quiet alert and active alert throughout a visit would not provide opportunities to observe the crying, sleep and transition states, so the mother would need to view the video examples.
6. Encourage parents to think about our discussion and use it where possible when caring for their baby in the subsequent week(s).
7. Provide parent with (a) the next session's pamphlet(s) and (b) a handout to stick on her refrigerator or crib outlining the key concepts from the day's session.

In each subsequent session:

8. Review the previous week's content by asking the parent questions like:

Did you see your baby do any of the things that we talked about?

Did that knowledge help you in any way? Was it easier to understand or help your baby?

9. Ask the parent if she has any questions about what was discussed last week.

Teaching and Learning Strategies

The results of the pilot study revealed that the teenage mothers tended to respond with more interest to the teaching when rationales were provided for the information discussed. For example, when mothers learned that children's subsequent IQ's were directly related to the number of words spoken to them in infancy, they responded with more interest and concern about the topic of talking to their babies, when covered in Session 4. Whenever possible, be sure to answer the "why" questions related to session content. *The rationale are either provided in the "Teaching Strategies for Teenagers" section in each session or are indicated in sections proximal to the concepts to be learned.*

Generally, reinforce and praise any of the mothers positive behaviours or comments. This will give your home visits a positive feeling and tone. Be complimentary and speak as though you have complete confidence in the mother's abilities, all the while pointing out the good things that she is doing and making suggestions for things she might like to try, mostly in the context of the pamphlet teaching. You want to gradually build upon the mother's confidence and abilities without being threatening. A good strategy is to allude to how well she is mothering compared to some other mothers you have met. She will probably ask for examples of the problems other mothers are having. You can point out problems other (hypothetical) mothers are having such as being unable to wake up their babies or to read their babies' hunger cues.

Also explain to parents that they can raise questions about any issue at any time during the program. For safety's sake, at the first visit ask parents how many wet diapers the baby is having per day. A well-nourished baby should have at least 6-8 wet diapers per 24 hours, approximately one with each feeding. This kind of information can be conveyed to parents to help establish that you are knowledgeable about baby care. Parents then will be encouraged to ask questions related to other mother and baby care issues. Record these questions and answers in your weekly notes.

As well, record any pertinent information from your weekly home visits, such as the names of people you met, the stories mothers convey to you regarding family members, or the baby, so that you will have something to follow up with the next week. An interest in other issues than just the program pamphlets conveys to parents that you are interested in them as a person, not just as a member of the program.

It was determined that the teaching strategies outlined in the Keys to Caregiving program and in the adapted research protocol are conceptually consistent with teaching strategies that have been successful with teenagers. For example, providing written materials, using audio-visual aids, avoiding lecture-style teaching in favour of a more participatory style of teaching, and recognition and reinforcement of achievement or performance are teaching strategies to which teenagers have responded well (Bachman, 1993; Drake, 1996; Mercer, 1979; Moore, Erikson, & Wurgel, 1984; Whitman, Graham, Gleit, & Boyd, 1986). Although it is well-recognized that teenagers often benefit from teaching in group sessions (Bachman, 1993; Drake, 1996; Whitman, Graham, Gleit, & Boyd, 1986), it is believed that this strategy is prohibited by the nature of parenting newborns in which new parents usually find that they need to stay at home with their babies in the early weeks of the adjustment and adaptation to new parenting.

In interacting with and teaching the teenage mothers, the principles and processes of the models described in Keys to Caregiving (NCAST, 1990) will be used (see Figures that follow). These are:

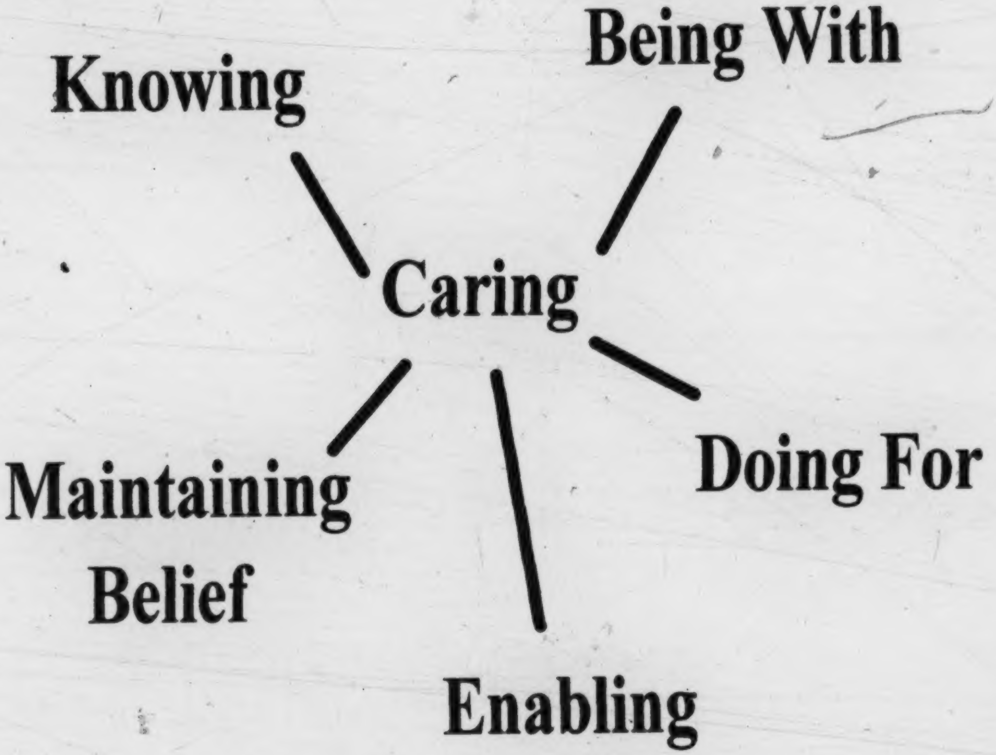
1. The Caring Model (Figure G-1)

2. The Teaching Loop (Figure G-2)

3. Nurse-Parent Communication Model (Figure G-3)

Figure G-1

Caring Model

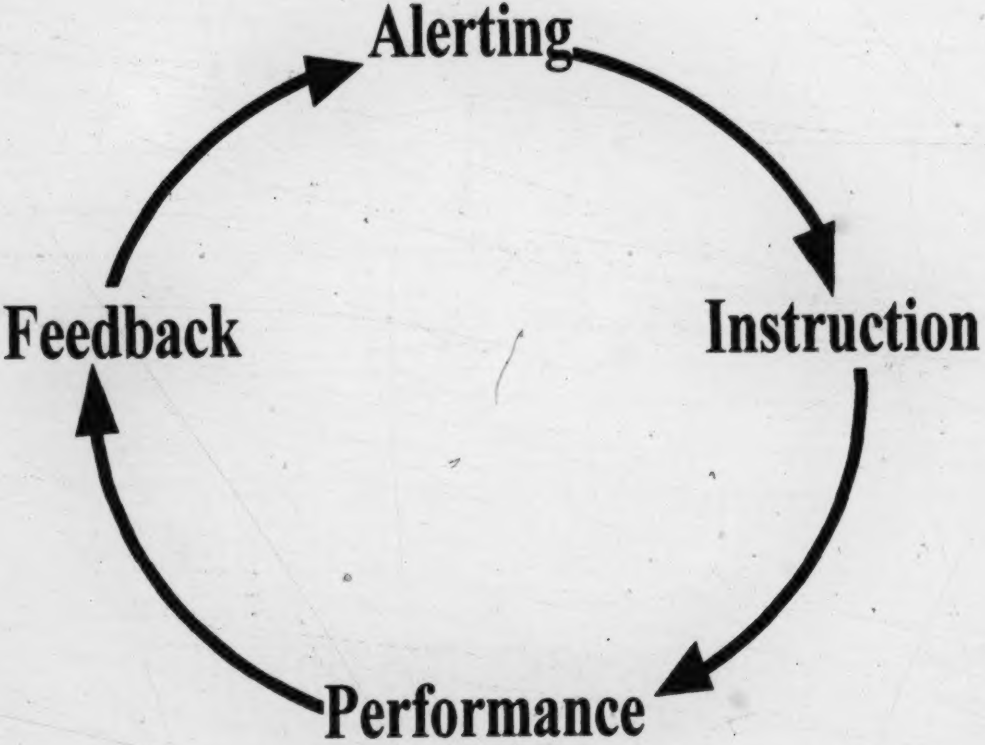

Knowing
Being With
Caring
Doing For
Maintaining Belief
Enabling

If they are adequately cared for, parents feel that:

- Someone is striving to understand their circumstances and the meaning the event has in their life (Knowing),
- Someone is emotionally present to them (Being With),
- Someone is able to do for them what they would do for themselves if possible (Doing For),
- Someone facilitates their passage through life changes and an unfamiliar event (Enabling),
- Someone has faith in their abilities to get through the transition or event and face a future of fulfilment (Maintaining Belief).

Figure G-2

Teaching Loop

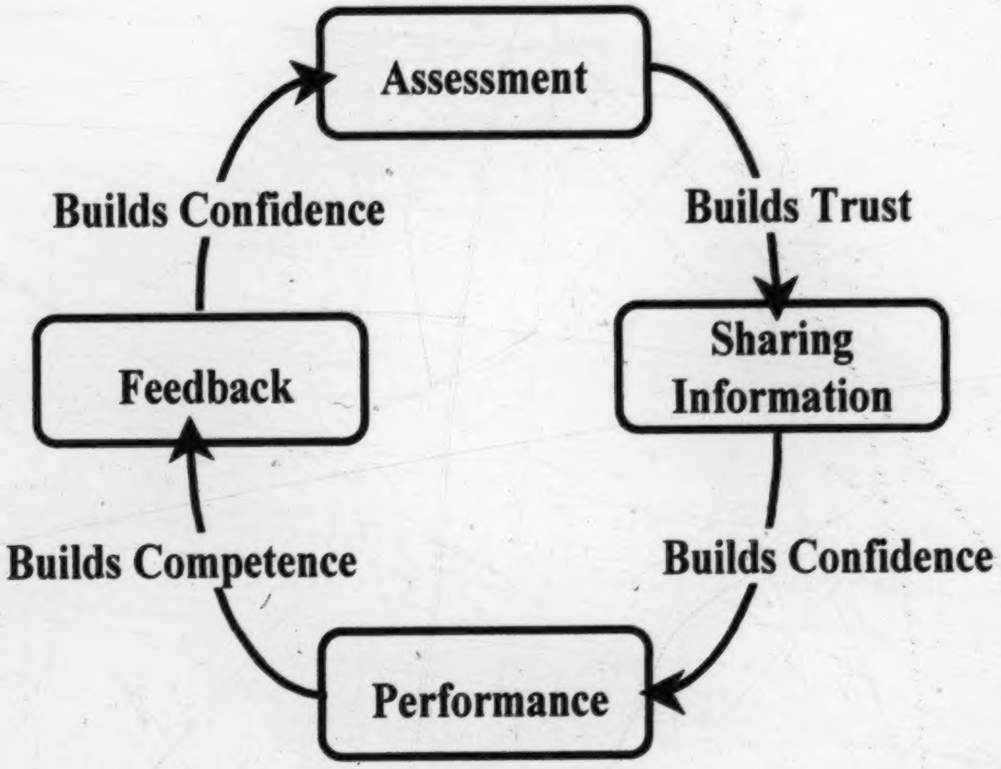

Alerting
Instruction
Performance
Feedback

Steward & Steward (1973) in NCAST (1990)

The teaching loop begins with *alerting* learners to the task at hand before providing some kind of *instruction*. Learners are then provided with the opportunities to *perform* what they have learned and are given *feedback* about what you saw them do or heard from them.

Figure G-3

Nurse-Parent Communication Model


Assessment
Builds Trust
Sharing Information
Builds Confidence
Performance
Builds Competence
Feedback
Builds Confidence

NCAST (1990)

The Nurse-Parent Communication Model is basically the Teaching Loop with two modifications. The term "alerting" has been changed to "assessment' and "instruction" to "sharing information". In assessing, the nurse asks questions that provide an opportunity to establish a caring rapport with the parents. It is this concerned assessment that builds trust. Once the assessment is complete, the nurse shares information with the parents. Sharing information about what is to be done and how gives parents increased feelings of confidence about what they need to do.

III. Development in Childbearing Teenagers

Table G-1

Developmental Tasks of Adolescence and Impact on the Adolescent Mother (Mercer, 1979; Olds, London, & Ladewig, 1988)

Developmental Task	Impact on Adolescent Mother
Acceptance and achievement of comfort with body image	-Must learn to deal with changed body: enlarged breasts and abdomen, striae, chloasma, weight gain, and may not have yet incorporated the changes of puberty. -May diet or eat poorly to return to pre-pregnancy shape due to peer pressure and slender image society has of women. -Must learn to deal with discomforts of breastfeeding, e.g. tension, pain, leaking.
Determination and internalization of sexual identity and role	-Must learn to incorporate concept of being a mother into identity. -Must cope with possible changes in relationships with friends, boyfriend, and family. -May see her role as a mother only, thus temporarily abandoning opportunities for development of other female roles.
Development of a personal value system	-Premature motherhood may be in conflict with self-ideal of chastity or of being a career woman. -Adjustment to premature motherhood and inherent responsibilities. -Incorporate problem-solving and decision-making skills into values.
Preparation for productive citizenship	-Adjustment to interruption of school. May see school as unnecessary or postpone indefinitely. -May incorporate career goals with parenting; may not consider working important.
Achievement of independence from parents	-Must cope with realities of motherhood, and dependence on family (or someone) for financial help. -Adjustment to need for financial assistance until she can earn her own living.
Development of an adult identity	-Learning to accept the responsibilities of adulthood and parenthood. -Learning to accept the responsibilities for her actions. -Learn to plan for her future.

Early Adolescence: Under Age 15

"Abdicating Control"

She still sees authority in the parents. During these years she is working to become comfortable with her changing body and her body image. She is a concrete thinker--the early adolescent has only minimal ability to see herself in the future or foresee the consequences of her behaviour. She perceives her focus of control as external; that is her destiny is controlled by others such as parents, the baby, and school authorities (Olds, London, & Ladewig, 1996). Mothers under 15 years of age have more difficulty moving into the maternal role or identity and still need to be mothered themselves. They need a person to mother them and to provide guidance in learning nurturant behaviours and meeting her infant's needs (Mercer, 1995).

Middle Adolescence: 15 to 17 Years

"Taking Control"

This is the time for challenging: Experimenting with drugs, alcohol, and sex is a common avenue for rebellion. She seeks independence and turns increasingly to her peer group. She wants to be treated like an adult. However, fear of adult responsibility may cause fluctuation in behaviour. At times, she seems like a child, while at other times, she is surprisingly mature. She is beginning to move from concrete thinking to formal operational thought but is not yet able to anticipate the long-term implications of all her actions (Olds, London, & Ladewig, 1996). The middle teenager, in the throes of evolving her identity as an adult capable of independence from her family is handicapped in achieving her maternal identity. She may achieve the role, but her functioning remains at a lower level of competence than older women (Mercer, 1995).

Late Adolescence: 17 to 19 Years

"In Control"

The young woman is more at ease with her individuality and decision-making ability. She can thing abstractly and anticipate consequences. During this time she becomes more confident of her personal identity. The experiences of middle adolescence assist her in completing her developmental tasks. The late adolescent is capable of formal operational thought. She is learning to solve problems, to conceptualize and to make decisions. These abilities help her see herself as having control, which leads to the ability to understand and accept the consequences of her behaviour (Olds, London, & Ladewig, 1996). As with the middle teenager, the older teenager, who may remain in the throes of evolving her identity as an adult, is handicapped in achieving her maternal identity. Again, she may achieve the role, but her functioning may remain at a lower level of competence than older women (Mercer, 1995).

Possible Psychologic Rationales for Adolescent Pregnancy (Olds, London, & Ladewig, 1988, 1996):

- Confusion or misinformation about conception and contraception (Humenick, Wilkerson, & Paul, 1991).
- Poor ego integrity, little sense of self-worth, and hopelessness regarding the future.
- Unstable family relationships.
- Needing someone to love (Holt & Johnson, 1991).
- Competition with the mother.
- Punishment of the mother and/or father.
- Emancipation from an undesirable home situation.
- Attention getting.
- Young woman's form of delinquency because this is one area that parents cannot control.
- In cultures where evidence of fertility is equated with adult status, the young woman who sees being a mother as her primary adult role will have little motivation to delay having a child (Moore, Erickson, & Wurgel, 1984).
- Result of unmotivated accidents (or lack of being in control)--the adolescent who is not yet capable of thinking abstractly, is unable to perceive the consequences of sexual activity. She has sex infrequently, often not planning to have it, and therefore does not consider contraception.
- She may have guilt feelings abut sex and being contraceptively prepared is an admission of "guilt" about sexuality.
- If the mother has been inconsistent nurturer, the daughter may enter adolescence with deficits in her sense of time, reality testing, and ability to handle frustration, making it difficult to accomplish her developmental tasks (Spain, 1980).

Table G-2

Tasks of Motherhood and the Adolescent (Mercer, 1979, 1990)

Task	**Impact on Adolescent Mothers**
Acceptance of pregnancy	May have difficulty bonding with baby and may be unresponsive toward newborn.
Acceptance of mother role	May not perceive of newborn as being her own, especially if her mother will be caring for the newborn; may think of newborn as doll or as sister.
Bonding	May feel ambivalent about motherhood.

IV. Session 1: Introduction & Infant States

1-7 days of age

Instructions

-Greet and spend time developing rapport with family. E.g. Comment on attractiveness of baby or baby's good behaviour. Play with baby.
-Exchange telephone numbers and indicate that mother can always call for any questions or concerns. Explain the participant cards, indicating their use to record important information like names, addresses, and appointments and that you will use them primarily while driving to find mothers' homes.
-Introduce the program to new mothers as described below.
-If the *Infant States* pamphlet was provided before the visit, ask the parent if she had a chance to read it. Record response. If not why? Busy week, etc.? Validate honest responses. If she has read the pamphlet, reinforce the practice.
-Cover the pamphlet and manual content, answering questions and using examples from her baby to illustrate concepts or behaviours. Be sure to discuss terms and pay particular attention to *italicized* comments.

Content: Introduction

An introduction to the intervention program ought to be provided prior to, or at the first home visit. Describe the program as decreasing parents' trial and error with their new baby. State that parents often learn all about their babies' behaviours and how to respond over time, but that we want to help them learn earlier. If they learn sooner, it will be more fun to be a parent. Skim through the five pamphlets, at least explaining the titles, emphasizing that the pamphlet content from week to week builds upon each other. Also explain that parents can raise questions about any issue at any time during the program.

Content: Infant States

Terms for Discussion

States: different levels of sleeping and waking. We know that babies do certain things in each state. Understanding what a baby's states mean can make being a parent more fun!

Interaction: playing with, feeding, or talking to your baby--anytime parents spend quality time with their babies! We know that this quality time affects the future development of the baby.

Key Idea

Quiet alert is the best time for interacting, including feeding, talking, looking at, or holding the baby. Babies will learn best in this state.

States

You may want to write the descriptions related to breathing in mothers' pamphlets:
Quiet Sleep (non-REM)-regular breathing, occasional startles
Active Sleep (REM)-irregular breathing, feeding will still be unsuccessful. If REM, then body still, if no REM, then body active.
Drowsy-irregular breathing. Main difference between Active Sleep and Drowsy is opening and closing of the eyes.
Quiet Alert-regular breathing
Active Alert-irregular breathing, parent may need to slow down or stop what she is doing in attempt to return her baby to quiet alert.
Crying-irregular breathing

During Sleep

During sleep, the infant has alternating episodes of active sleep and quiet sleep. This alternating pattern is called a sleep cycle, and involves a period of active sleep, followed by quiet sleep, and then by another period of active sleep. *In the newborn, the sleep cycle lasts about 60 minutes, with a range of 60 to 90 minutes. Fifteen to twenty minutes of this 60 minutes are spent in quiet sleep and 35-60 minutes in active sleep.* At the end of the sleep cycle, the infant awakens or begins another sleep cycle.

Drowsy

As the infant shifts from sleep to awake a transitional period combines characteristics from both the sleep and awake states. This transitional period is called the drowsy state. The drowsy state allows the infant to adjust to incoming stimulation as s/he moves from sleep to awake. Infants generally become physically active at the end of a sleep cycle, promoting arousal. With increased arousal and awakening, infants become aware of internal stimuli such as discomforts of hunger, wetness, loneliness, or fatigue. Infants become more active and may fuss or cry in response to these forms of stimulation. This in turn signals their parent to respond.

The drowsy state also allows the infant to move from awake to sleep. As babies tire from stimulation or become full from eating they frequently fall asleep. The parent may aid the infant's shift from awake to sleep by decreasing the amount of stimulation provided or by providing soothing repetitive stimuli such as rocking. *Unless the infant has slept a long time and needs to feed, the parent should be encouraged to wait rather than waking a drowsy baby. The baby may go back into yet another cycle of active sleep-quiet sleep-active sleep if left undisturbed.*

During Awake

External stimulation provided such as moving or undressing the baby, helps bring the baby to a more awake state. As the baby becomes more aware, other forms of stimulation, such as lights, temperature and noise, may awaken the baby further. *The parent who helps the infant awaken at the end of the sleep period and then interacts* *when the infant is more responsive will have an infant with more organized sleep/wake patterns.*

Once an infant is awake, parents continue to help the infant stay awake by diapering, feeding, bathing, and playing with their infants. It remains that the maturity of the infant determines, in part, the duration and movement through the awake states. *While awake, babies alternate between quiet alert and active alert states. Parents can help babies maintain the quiet alert state and prevent crying by responding to babies' needs for a change when they go into the active alert state. Examples of breaks include position changing or decreasing stimulation. (This is an excellent way of introducing concept of engagement/disengagement without using those terms.)*

Whatever the reason, *infants who have long periods of being awake benefit from frequent opportunities to interact with parents, unlike infants who sleep more of the time. Longer awake periods have advantages for the infant in later cognitive development. So, when the baby is awake, the parent should talk to, look at, feed, hold, or play with the infant.*

As the Infant Grows and Matures

Periods of both sleep and wake become longer with age. *By the end of the first month the infant sleeps approximately 13-14 hours a day.* Although newborns may sleep for long periods during their hospital stay, upon discharge their pattern is frequently one of short periods of sleep followed by short periods of wakefulness. *By two weeks of age, infants are combining sleep cycles, which may result in 4-hour sleep periods.* By three months they are combining several cycles, the resulting number of hours of sleep remains fairly constant. What does change is when infants sleep. As infants mature they consolidate sleep to occur mainly during the night. Parents find this change in pattern a welcome relief.

Periods of wakefulness become longer with age, providing more opportunities for interaction. *During an infant's first few weeks of life, the average duration of wakefulness is approximately 2 hours, whereas, by three months it has increased to 3 hours.* Increased periods of wakefulness occur between 8 and 20 weeks of life as infants make fewer transitions from sleep to awake. Parents enjoy the longer alert periods at a time when infants are getting to be more social and fun to be with.

As infants mature, the length of time spent in sleep and wakefulness changes. Periods of sleep and wakefulness become longer, so that in time the infant's sleep/wake cycle grows to match that of the parents.

Video Excerpt

-Sequence from Keys to Caregiving, Tape 1, in which the 6 infant states are demonstrated.

Teaching Strategies for Teenagers

Use examples from the teenage mothers' everyday experiences. Ask her what she looks like when she is drowsy, as when she first wakes up in the morning. Is her face bright or dull? Are her eyes opened wide and bright or glazed and heavy lidded? Discuss with her how people look when they are interested in something, as in the quiet alert state. For example, they will have smooth, not jerky movements, and will focus on faces or voices. If parent indicates that she has observed her baby in the various states, compliment her on her sensitivity. Often parents describe that their baby sleeps longer than the stated average length of sleep cycles. When this happens, point out that her baby must be more mature than other babies--this always brings smiles to mothers' faces! Generally, reinforce and praise any of the mothers positive behaviours or comments. This will give your home visit a positive feeling and tone.

Final Instructions

-If the mother has not completed the exercise on the back of pamphlet, go through it with her and then ask her to do it by herself for next week.
-Go through the video excerpts of examples in cases where her baby did not illustrate concepts or behaviours adequately.
-Encourage the parent to think about our discussion and use it where possible when caring for her baby in the next weeks.
-Provide the handout for the refrigerator or baby's crib, outlining the key concepts from the day's session.
-Provide the handouts for next week on *State Modulation* and *Infant Behavior*.
-Make appointment for next session.
-Note compliance and impression of how well mother understood material after the session.

RECAP: Quiet Alert state is the best time for interacting and play that provide valuable learning experiences for babies. Quiet Sleep is the best time for activities like trimming nails. When babies wiggle around a lot and cry out in their sleep, if their eyes do not open, do not pick them up to soothe because they are still asleep!

Notes

Date:
Length of Visit:

V. Session 2: State Modulation & Infant Behaviour

1-2 weeks

Instructions

-Spend time further developing rapport with family. Follow up on any discussion or questions from previous week.
-Comment on attractiveness of baby or baby's good behaviour. Play with baby.
-Review the previous week's content on *Infant States* by asking the parent questions like: Did you see your baby do any of the things that we talked about? Are you recognizing the sleep and awake states?
Did that knowledge help you in any way?
Was it easier to understand/help your baby?
-Finally, go through the exercise on the back of *Infant States* pamphlet.
-Ask the parent if she has any questions about what was discussed last week.
-Ask parent if she read *State Modulation* and the *Infant Behavior* pamphlets. Record her response. If yes, reinforce practice. If not why? Busy week, etc.? Validate honest responses.
-Cover the pamphlet and manual content, answering questions and using examples from her baby to illustrate concepts or behaviours. Be sure to discuss terms and pay particular attention to *italicized* comments.

Content: State Modulation

Term for Discussion

Modulation: To change something. State modulation is changing a baby's sleep and awake states. E.g. waking up a sleepy baby to eat or play, or settling a fussy baby to sleep. Babies can modulate their own states or parents can help.

Key Idea

State modulation is important because parents can help their babies to wake up for feeding and playing together (interacting) or to be soothed and fall asleep. Babies can also soothe themselves.

How Parents Can Act to Modulate States

With experience, parents learn how ~~to~~ assist their babies to fall asleep or be soothed. These behaviours become so natural to parents, they may not be aware that they are doing them. However, new parents may not know how to awaken a sleepy baby for feeding.

Variety to Awaken ("Many different ways in an active style")

New babies are often very drowsy and need to be awakened for feeding. This is essential in the early weeks to ensure that adequate infant nutrition is provided and in the establishment of breastfeeding. In particular, helping a baby to wake up for feeding will promote the establishment of more regular and well-organized sleep and wake cycles. For example, an infant who remains awake to feed longer will take in more food (and in the case of breastfeeding is more likely to get the hindmilk) that promotes a longer sleep or content period to follow (Brazelton, 1992).

To awaken a baby, provide a variety of new and changing stimuli in an active style in tune with the state and needs of the baby. Many different activities, undressing, repositioning, talking to, and touching, may awaken the infant. *Parents may also want to help awaken their baby for more successful interaction or play.*

Take time to demonstrate these activities with the parent
Unwrap the infant.
Undress the infant.
Hold the infant 7-8 inches away from your face and talk gently.
Make your voice high or low.
Vary your speed of talking.
Give the infant something to grasp or suck.
Sit the infant up.
Hold the infant upright on your shoulder.
Rub the infant's stomach gently.
Stroke the infant's cheek gently.

Self-Soothing

When an infant starts to fuss or cry, the parent can wait (about 15 seconds) to see if the infant is able to gain control by using self-consoling activities such as bringing hand(s)-to-mouth, sucking of fingers, fist or tongue, changing positions, and paying attention to faces, voices, sights and sounds in the environment.
Rationale: It is important to allow the 15 seconds for self-soothing, because if the infant is successful, this will help foster the infant's developing sense of self-control and independence.
It is important not to cover the infant's hands with anything like mittens or socks as this will prevent the infant from being able to soothe him or herself as s/he has done in utero. If parents are concerned about the infant scratching his or her face, then they can be taught about trimming the infants' nails after a warm bath and during the quiet sleep state. Nails can be gently trimmed with baby clippers or peeled.

Responding Quickly

However, if the infant could not self-console within the 15 seconds, it is just as important for the parent to respond quickly to help soothe the infant.
Rationale: Research has shown that responsive caregiving can promote the development of more secure attachments to caregivers and trust in caregivers (Egeland & Farber, 1984; Spieker & Booth, 1988). In turn, it has been shown that secure attachments are

linked to greater success in social relationships and in cognitive development (Shore, 1997).

Contrary to many mothers' stated beliefs, an infant cannot be "spoiled" by responding quickly. In fact, responding quickly in the early months of infancy can prevent the development of more severely persistent crying in the later months of infancy. Not until the infant becomes cognitively aware (demonstrated by "stranger anxiety") can an infant start to cry merely for attention. It is at this stage that parents must make sure that ample quality time has been spent with their infant, before setting limits on excessive attention-seeking behaviours (Brazelton, 1992).

Repetition to Soothe ("One or more ways over and over in a slow style")

To soothe an infant, repeat one or more comforting actions, rocking, stroking, or talking in a soft, steady voice, over and over. The pacing, in contrast to the variety used to awaken, is slow, rhythmical, unchanging, and is provided in a calming manner.

Take time to demonstrate or discuss these activities with the parent

Give the infant his/her hand to suck on.
Show the infant your face.
Place your hand on the infant's torso.
Hold gently both of the infant's arms close to his or her body.
Talk to the infant in a steady, soft voice.
Sing, hum, or croon to the infant.
Let the infant suck on a pacifier.
Pick up and hold the infant close to you.
Rock the infant.
Wrap the infant snugly (not tightly) in a blanket.
Stroke one area of the infant's body such as the head, foot, or back.
Take the infant for a walk in the stroller or a drive in the car.
If all else fails, loud white noise from TV static or a vacuum cleaner may help.

Crying

Crying is very stressful for parents. Parents have been found to have increased heart rates and blood pressures while listening to infant crying (Frodi, 1981). Particularly for single mothers without someone to provide needed breaks from infant crying, crying can push people's frustration levels to the limit. Given the increased risk of physical abuse (e.g. shaken baby syndrome) associated with persistent infant crying, it is essential that parents take breaks from soothing, even if there is no one there to help. The 10 minutes on (soothing), 10 minutes off (break) is essential. Parents, once assured that their baby is fed, dry, burped, and healthy, can place their babies in a safe place such as the crib, and take a 10 minute break from soothing. It is important to do something different, such as listen to music or to go into the backyard away from the sound. *Parents must be reassured that if they are conducting all of the soothing techniques described and if they are certain that their baby is safe and not ill, they should not feel guilty or shameful at* *their inability to soothe their baby. Some babies simply cry, almost as if they are in a sleep or awake state that lasts a couple of hours.*

Parents can also be reassured that babies start to cry less again after the 6 week peak of crying and are typically over the crying phase by about 12 weeks of age. While the babies are in this phase, they usually cry more in the evening, and it has nothing to do with dad, family, or friends coming home from work or school (Brazelton, 1992).

Content: Infant Behavior

Terms for Discussion

Habituation (getting used to it): The ability to shut things out that bother them. E.g. when your baby will sleep through loud noise like company or vacuuming.

Readability: The baby's ability to tell parents what s/he wants or how clear and consistent infants are in their behaviour.

Key Idea

When parents know what infants are capable of, they are more likely to interact with and respond appropriately to their infants. This in turn fosters more successful and enjoyable caregiving.

Understanding and Eliciting Infant Behaviours

Infants are capable of actively participating in interactions with both people and things like toys in their environment. In this session, guide the parent through eliciting the baby to turn to her face, voice, and a toy or tell her about them and get her to perform them on her own if her infant is unavailable. *Emphasize that this is important play to foster baby's mental development.*

Infant state is an important consideration when eliciting infant behaviours. The quiet alert state is when you can get the best visual response from the infant. If the baby was available to demonstrate the variety to awaken concept in the state modulation content, the quiet alert state may have been achieved, and the mother can be guided directly through these activities.

The best distance for babies to focus on objects is 7-8 inches from their face; however, this distance is also babies' space. It is fine to enter this space to burp or kiss babies, but when parents loom too close during play, this can cause the infant to enter into the active alert state or even crying.

For the remaining concepts in the pamphlet, *cuddling, smiling, and moving,* talk to the parent about how their baby is unique in all these behaviours listed in the pamphlet. Discuss with parents that jerky movements and startles are generally not related to their

caregiving but are part of the infant's state and maturity. Also indicate that some babies are very cuddly, while others resist cuddling. Cuddliness is usually a rewarding behaviour for the parent, seeming to convey a message of affection. If infants do not nestle and mold, discuss this tendency and show the parent how to position their infant to maximize this response.
Rationale: When parents fill babies' needs to be cuddled, the baby develops a sense of being loved and valued, which can contribute to developing self-esteem (Brazelton, 1992).

Infants can *"get used to" or shut out* most stimuli. Because of this ability, families can carry out their normal activities without disturbing infants. Use examples from other parents, such as the baby who slept through the fire alarm or through all the company. However, be sure to emphasize that some infants have more difficulty with this and will probably not sleep well in active environments.

From the last content on state modulation, parents will recognize that babies differ in how *irritable or consolable* they are. Parents need to be reminded that irritability and consolability may not relate to their caregiving, especially if they are trying all of the soothing techniques just discussed.

Finally, babies can tell parents what they want, although they differ in how *readable* they are. Babies have their own individual way of responding. By observing and understanding infants' behaviour, parents can respond more appropriately to their infants as individual.

Video Excerpt

-Show video excerpt from Keys to Caregiving, Tape 2 in which "Alertness", "Visual Response", "Auditory Response", "Habituation in Quiet Sleep", "Habituation in Active Sleep", and "Cuddliness and Smile" are shown.
-Show video excerpt from Keys to Caregiving, Tape 3 in which "Variety to Awaken" is shown (there are two examples). Follow this with excerpt from Tape 2, in which "Self-Consoling" and "Consoling by Caregiver" are shown. The example of "Pacing/Consoling During Diaper Change" from Tape 2, may be on tape for teenagers in which extra emphasis needs to be placed on the concept of pacing or following the baby's lead.

Teaching Strategies for Teenagers

Work through the state modulation strategies with the teenager. Get her to awaken her baby, if appropriate, after you have demonstrated some of the actions. In discussing self-consoling, ask the mother if there has been a time when her baby fussed or cried while she was busy eating or showering or something. When she finally rushed to see what was wrong, has she ever found that when she came to her baby's aid, the baby was fine? If the teen expresses frustrations similar to those described above under "crying" for her inability to soothe her baby, validate and diffuse any guilt from her experiences. Remind her about the times when she was pregnant that she couldn't stop crying. That may help her relate to her baby. Also provide her with reassurance that she will get better at reading her baby's cues, which soon will make soothing and responding appropriately easier. *Tell parents that next week we will learn all about Infant Cues to help them read their babies better.*

Also work through the activities where the infant follows her face, voice, and a toy. Suggest that she and the baby's father (or grandparent or friend) lay baby down on a flat surface such as a bed or couch and take turns talking to the baby in order to have baby turn first to the mother then to other person. Reinforce and provide vigorous encouragement for every attempt and every success! Compliment her and her baby on their quick learning abilities.

Final Instructions

-Go through video excerpts of examples in cases where her baby did not illustrate concepts or behaviours adequately. This may be best done in turn, i.e. show the *State Modulation* video excerpts directly after teaching, and the *Infant Behaviour* video excerpts directly after teaching. This will need to be evaluated.
-Encourage the parent to think about your discussion and use it when caring for her baby in the next weeks.
-Provide the handout for the refrigerator or baby's crib, outlining the key concepts from the day's session.
-Provide the handout for next week on *Infant Cues.*
-Make appointment for next session.

RECAP: Use variety to awaken and repetition to soothe.

RECAP: Babies can hear, see, and communicate from birth. Your baby can shut out things that bother him her and can tell you what she he wants.

Notes

Date:
Length of Visit:

VI. Session 3: Infant Cues

2-3 weeks

Instructions

-Spend time further developing rapport with family. Follow up on any discussion or questions from the previous week.
-Comment on the attractiveness of the baby or baby's good behaviour. Play with baby.
-Comment on how mother is doing well or compliment her in some way. For example, she is obviously a good mother since her baby is so content, or something like that.
- Review the previous weeks' content on *Infant States* and *Infant Behaviour* by asking the parent questions like:
Did you see your baby do any of the behaviours, like smiling or turning to your voice?
Did that knowledge about variety to awaken and repetition to soothe help you in any way?
Was it easier to understand/help your baby?
-Ask the parent if she has any questions about what was discussed last week.
-Ask parent if read *Infant Cues* pamphlet. Record response. If yes, reinforce practice. If not why? Busy week, etc.? Validate honest responses.
-Cover the pamphlet and manual content, answering questions and using examples from her baby to illustrate concepts or behaviours. Be sure to discuss terms and pay particular attention to *italicized* comments.

Content

Terms for Discussion

Cues: Babies' non-verbal language that is made up of gestures, movements, postures, and expressions.

Engagement: Babies' engaging cues tell parents that they want to interact. They say "I want to interact", "I am interested", or "I want attention". Examples include smiling, looking at, and reaching out to another.

Disengagement: Babies' disengaging cues tell parents that they need a break in the interaction. They say "I need a break" or "I've had enough". Examples include crying, turning head away, and falling asleep.

Key Idea

Parents can learn to understand their babies' language and this can provide a foundation for a communication bond that will last a lifetime.

Engagement & Disengagement in Interactions

Infants are capable of communicating their needs and wants through infant cues. Some cues are ***easy to see***, while some cues are ***harder to see***. The harder to see cues are thought to come before the easy to see cues. When parents can read the harder to see cues they are more sensitive in their interactions with their babies.

Babies can only take in so much stimulation before they need a break. They engage for a while and then turn away for a while before turning back again to re-engage. *When parents allow the baby to turn away and wait for the baby to turn back, they have longer and more successful interactions.* Parents can give their babies a break by simply stopping whatever they are doing, e.g. talking, showing a toy, or bouncing the baby. Babies can usually engage for 3 to 5 seconds, followed by 3 to 5 seconds of disengagement. When babies reach out their arms and legs towards their parents during interactions, they can sometimes engage longer--for about 5 to 10 seconds. Then they disengage for a longer period of time--about 10-15 seconds or more.

Sensitive parents will notice the disengaging cues that are harder to see, such as frowning, looking away, yawning, etc. in their baby, and may then prevent their baby from displaying the easy to see cues, such as crying, choking, falling asleep, etc. Babies are also more likely to engage longer if their harder to see disengaging cues are responded to by their parents.
Rationale: Parents who respond to the harder to see cues, whether engaging or disengaging, will have babies who will grow up feeling that they are well understood by their parents, enhancing the trust and attachment between baby and mother. In turn, we know that well attached babies grow up to do better in school and have more successful peer relationships than less-well attached babies (Bretherton & Waters, 1985).

No one cue can tell the parent everything that the infant is communicating. Usually, there is a mixture of engaging and disengaging cues. Parents need to look for the most dominant cues to tell whether the infant is more engaging or disengaging. This knowledge can help parents become confident in understanding what their babies are feeling or wanting by looking at groups of cues and watching for the most dominant cues. *This will help the parent to follow the baby's lead.* Most of the cues are listed in the pamphlet. Only those not listed will be noted in this section.

Engagement Cues "I want to interact"

Easy to See	**Less Easy to See**
All listed in pamphlet	Hunger posture
	Feeding posture

Disengagement Cues "I need a break"

Easy to See

Cry face
Halt hand
Hand-to-ear[3]

Less Easy to See

Facial/lip grimace
Hand-behind-head

Hunger Cues & Full Cues

Certain cues can form a pattern and tell parents a specific need. Two examples are ***hunger cues*** and ***full cues***. Hunger cues tell parents when their baby is hungry and full cues tell parents when their baby is full. Being able to tell when babies are hungry or full is important to new parents. In the past, crying was viewed as the major signal of hunger in a baby. However, crying may also be telling parents that their baby is lonely, afraid, tired, or in pain. Knowing the hunger cues and full cues can help parents become confident about when their baby needs to be fed.

Hunger Cues "I am hungry"

Clenched fingers and fists over chest and tummy
Flexed arms and legs
Mouthing
Rooting

Full Cues "I am full"

Arms and legs extended
Arms straightened along sides
Finger extension
Pushing away

Video Excerpt

-Show excerpt from Tape 3, in which the "Easy to See" and "Harder to See", "Engagement Cues" and "Disengagement Cues" are shown. "Hunger Posture" and "Feeding Posture" ought to be shown with the harder to see engagement cues. As well, the "Hunger Cues" and "Feeding Cues" with two examples of each should be shown.

Teaching Strategies for Teenagers

After discussing the engagement and disengagement cues, if the baby is awake, ask the mother to characterize her baby's behaviours at that time. Are they mostly engaging or disengaging? If the baby is not awake, be sure to do this at the next opportunity, perhaps during next week's review discussion. If the mother is too shy to venture her views, label the baby's behaviours for the mother. Reinforce any attempts to participate in this activity.

Also use examples from the mother's own experience to illustrate the engagement and disengagement cues. Ask her what she does when she is bored or tired in school. Does she look away from the teacher, yawn, get a dull-looking face and eyes, pull at her hair or ears (similar to hand to ear, or hand behind head)? Does she fall asleep in class and become restless (squirm) waiting for the bell to ring? Who hasn't done these behaviours when the teacher asks a question and you don't want her to pick you to answer it? In contrast, how does she act when she is interested in something or someone? Does she raise her head, open her eyes wide, and give up the dull looking face for a brighter one? She probably also would look at it or them, smile, move at least her arms toward it or them (she might raise her hand!), and keep her movements smooth (not jerky). Naming some of the mother's behaviours during the teaching as engaging or disengaging is also helpful. Hopefully she is not yawning! *Also use examples to illustrate that sensitive parents will notice the disengaging cues that are harder to see, such as frowning, looking away, yawning, etc. in their baby, and hopefully prevent the baby from displaying the easy to see cues, such as crying, choking, falling asleep, etc.*

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[3] Almost anytime that a baby moves his/her hands to his head, this can be viewed as a less easy to see disengagement cue.

After learning about the hunger and full cues, parents may be asked to think of themselves when they are hungry. We flex our arms as we bring them to our mouths to eat. This hand-to-mouth movement continues until we begin to feel full. Once full, we decrease our mouth movements, and extend our arms, and may actually push ourselves away from the table as a signal that we are finished eating. Ask parent to consider her behaviour after a big meal like Christmas Dinner. She may want to lie on the couch, extend her arms along her sides, and fall asleep.

Final Instructions

-Go through video excerpts of examples in cases where her baby did not illustrate concepts or behaviours adequately.
-Encourage parent to think about your discussion and use it where possible when caring for baby in the next weeks.
-Provide the handout for refrigerator or baby's crib, outlining the key concepts from the day's session.
-Provide the handout for next week on *Feeding is More than Just Eating.*
-Make appointment for next session.

RECAP: Babies engagement and disengagement cues can tell you when they want to be held, fed, play, or need a break.

Notes

Date:

Length of Visit:

VII. Session 4: Feeding is More than Just Eating & The Barnard Model

3-4 weeks

Instructions

-Spend time further developing rapport with family. Follow up on any discussion or questions from the previous week.
-Comment on the attractiveness of the baby or baby's good behaviour. Play with baby.
-Comment on how mother is doing well or compliment her in some way. For example, she is obviously a good mother since her baby is so content, or something like that.
- Review the previous weeks' content on *Infant Cues* by asking the parent questions like:
Did you see your baby's engagement and disengagement cues this week? How did you respond?
Did that knowledge help you in any way?
Was it easier to understand/help your baby?
-Go through the exercise from the Key Idea sheet.
-Ask the parent if she has any questions about what was discussed last week.
-Ask parent if she read *Feeding is More than Just Eating* pamphlet. Record response. If yes, reinforce practice. If not why? Busy week, etc.? Validate honest responses.
-Cover the pamphlet and manual content, answering questions and using examples from her baby to illustrate concepts or behaviours. Be sure to discuss terms and pay particular attention to *italicized* comments.
-Introduce the Feeding is More than Just Eating as a nice review of all that has been learned over the past weeks. It puts all of the learning together.

Content

Terms for Discussion

Cognitive Growth-Fostering: Behaviours that help develop a baby's mental development, e.g. IQ, and school performance.

Social-Emotional Growth-Fostering Activities: Behaviours that help develop a baby's growing sense of self-confidence, self-esteem, emotional health, and social skill. Examples include touching babies gently, and saying positive things to babies.

Key Idea

Feeding is an important time to pay attention to your baby's cues and to interact by playing and talking to your baby.

Why Look at Feeding?

In this session, baby feeding is the example of an everyday interaction; however the behaviours discussed can happen during any interaction, such as playing, diaper changing, etc. It remains that feeding is one of the most consistent times that infants are awake and available to interact. The feeding time provides parents with an opportunity to come to know and better understand the infant's behaviour, read and respond to the infant's cues, and interact with the infant to accomplish the task of feeding.

Successful Interactions

To have successful interactions, parents and babies must actively adapt to one another's behaviours. Both have responsibilities in keeping the interaction going, as demonstrated by the Barnard Model *(the name of the model does not have to be given to the parent).* Infants must produce ***clear cues*** and be ***responsive to the parent***. Parents must respond to the ***infant's cues, alleviate the infant's distress***, and ***provide social-emotional and cognitive growth-fostering situations***.

Interference in the parent's and baby's adaptive interactions can be from the parent, the infant, or the environment. Parents may be ill, depressed, stressed, or lack knowledge of infant behaviour, or a crisis may exist in the environment. As a result, parents may become less sensitive to the infant's cues, unable to alleviate the infant's distress, or unable to provide growth fostering types of situations for the infant.

An infant's inability to give clear cues or respond to the parent may also cause interference in the adaptive process. For example babies may have illnesses (e.g. problems associated with prematurity) that could affect the interactions (Letourneau, 1997). If one partner is not able to interact well, than this affects the overall interaction; *however parents can help to improve interactions by holding up their part of the interaction.*

Successful interactions require that parents consider the topics discussed in the pamphlet, including *holding, state, safety, talking, touching, movement, mood, and tension.* Go through each of these with reference to the parent's roles and responsibilities during the feeding.

Parent's Roles and Responsibilities During Feeding

Sensitive to Cues

Parents position the infant so they *(***Holding and Safety in pamphlet***)*:

Can see the infant's eyes and face,
Hold the infant in close contact with their body.

Rationale: Positioning enables the parent to read and respond appropriately to the infant's cues. E.g. if the infant displays the harder to see cues of raising his her head or face brightening, the parent can respond by talking to or playing with the infant. If the child starts to choke during the feeding, the parent can respond by sitting the baby up. It also ensures that the infant is supported safely for the feeding, e.g. milk will not be induced to drain into the infant's ear canal from a flat or head-down position. Supportive positioning is also important for playing. If a parent wants an infant to focus *on a toy, for example, supporting the baby's head is essential for the infant to be able to concentrate his/her energies on focusing. In addition, holding the infant in close contact not only enables the parent to read and respond to cues better, it will also convey to the infant a feeling of warmth and loving care that will help to enhance social-emotional development.*

Parents recognize and respond contingently to the infant's cues when they:

Position the baby so mother can see and feel her infant's cues,

Pace the amount and intensity of their activities to the needs of the infant, i.e. when the infant displays hunger cues, the parent starts the feeding.

Rationale: When a baby is responded to contingently, this reinforces to the infant that his/her parent is sensitive and understands his/her needs. It also helps with the infant's developing sense of understanding of and control over his environment. E.g. the infant will come to recognize that when s/he mouths and roots, his/her parent will feed him/her. An understanding of cause and effect and an ability to predict or expect events in the environment develops which may encourage the child to explore his/her environment further and motivate learning when older (Goldberg, 1977; Lewis & Goldberg, 1969).

Responsiveness to Distress

Parents recognize and respond to the infant's potent disengagement cues when they:

Stop the feeding,

Change the infant's position,

Touch or talk in a soothing manner.

Rationale: When a baby is responded to when in distress, this reinforces to the baby that his/her parent is sensitive and understands his/her needs. Such sensitivity and responsiveness fosters the development of secure attachment which we know has many other long term benefits such as enhanced peer relationships and social skill (Lieberman, 1977).

Provide Growth-Fostering Situations

Parents engage in ***social-emotional*** experiences when they **(Touching & Movement, Mood, and Tension in pamphlet)**:

Make eye contact and say positive things to their babies,

Touch affectionately,

Laugh and smile during the feeding,

Hold the infant in close contact with their body,

Relax and enjoy the feeding,

Move in and out of the en face position.

Rationale: When a baby is touched affectionately and praised, and the parent genuinely seems to enjoy the feeding time, the baby will feel valued and his/her social-emotional development will be fostered. In contrast, we know that babies of depressed mothers tend to have decreased facial smiling and may later have problems playing or interacting with their peers (Shore, 1997).

Parents provide ***cognitive growth*** fostering experiences when they ***(Talking)***:
Talk about sights, sounds, and experiences,
Allow and encourage exploration by the infant.

Rationale: We know that there is a direct relationship between the number of words spoken to babies and the resulting language abilities and IQ (Anastasiow, 1993; Shore, 1997). Of course this has implications for school achievement, but it also affects how well children will interact with their peers. Children who do poorly in school tend to have strained peer relationships that make achievement all the more difficult (Ladd & Le Sieur, 1995; Rubin, Stewart, & Chen, 1995; Sumner & Spietz, 1995a, 1995b). The content of what is said is important too. Parents ought to use words that describe the qualities of objects, like colour, number, or texture, to foster improved language abilities and IQ (Sumner & Spietz, 1995a, 1995b).

In addition, encouraging the baby to explore his or her environment, by for example playing with the bottle, the mother's clothing, or a toy during the feeding tends to make children smarter and more likely to explore and learn when they get older (Bretherton & Waters, 1985). Providing opportunities for the child to know what to expect next by telling the child what you are going to do before you do it, tends to give the developing child a sense of control or understanding of his or her environment (rather than helplessness) which fosters exploration and learning in children. A good example is when parents tell the child that they are going to stop feeding in order to burp the baby or to change breasts (Lewis & Goldberg, 1969).

You may want to briefly discuss research related to infants who were institutionalized and had caregivers who were not sensitive to cues, responsive to distress, or providing of growth-fostering situations. These extreme cases of neglect frequently resulted in helpless children who had learning difficulties, language difficulties, problems interacting with their peers, poor school achievement, and behaviour problems (Ames et al., 1997).

Infant's Roles and Responsibilities During Feeding

Clarity of Cues

Infants give clear cues to their parents when they **(State in pamphlet)**:
Give recognizable hunger cues when hungry,
Demonstrate satiation cues when full,
Give interaction (engagement) cues as they attend to the parent,
Show rest (disengagement) cues when they want a break or to withdraw.

Rationale: Infants must give clear cues to enable parents to respond appropriately. Use an example of a "colicky" infant to demonstrate point.

Responsiveness to Parent

Infants are responsive to their parents when they:
Show interest in sucking and eat when food is offered,
Look in the direction of their parent's face or eyes,
Adapt their body physically to being held or moved,

Respond to their parents' attempts to interact and soothe.
Rationale: Following from the previous example of a "colicky" baby, when a baby will not settle in spite of the parent's attempts at reading and responding appropriately to the cues, this causes a breakdown in the interaction.

Video Excerpt

-Show the example of a "Good Feeding Interaction", on Tape 5, in which parents' responsibilities and infants' responsibilities are shown. This is at the end of the tape.

Teaching Strategies for Teenagers

For each role and responsibility described above, be sure to provide the rationale for the information. Demonstrate the en face position by turning your head into the exact vertical and horizontal position as the parents. Demonstrate positioning that is not en face to contrast. Through this demonstration, it can be explained that it is much easier to focus on a face in the en face position.

Use the example of "dinner" as a social experience to get teenage mother to think of her baby's perspective. If a mother's dinner partner did not talk or smile, she likely would think they were not enjoying the meal or her company. It is the same for babies. She would not want her baby to think that she did not value his/her company and love him/her.

The back of the pamphlet serves as a nice review of the "I want to eat" cues, " I need a break or rest" cues, "I am full" cues, and the "I want to be with you" cues. The "Suck/Pause" cues provide an opportunity to emphasize again the importance of responding to behaviours and how infants develop expectations that fuel their mental development. The fact that some describe the suck/pause cues as the first form of communication may be interesting the parent. Ask the parent what she does when her baby pauses during the feeding. Does she talk to him/her, jiggle the nipple, tickle him/her? *Emphasize that talking is the best way to respond* as jiggling the nipple may be a bit annoying. Ask them to imagine someone jiggling their fork around in their mouth every time they paused in eating!

Final Instructions

-Go through video example of feeding in which mother and baby demonstrate all of the roles and responsibilities necessary for a successful interaction.
-Encourage the parent to think about our discussion and use it where possible when caring for baby in the next weeks.
-Provide the handout for the refrigerator or baby's crib, outlining the key concepts from the day's session.
-Start preparing the mother for termination.
-Make appointment for next session.

RECAP: For successful interactions, infants must produce ***clear cues*** *and be* ***responsive to the parent****. Parents must respond to the* ***infant's cues, alleviate the infant's distress,*** *and* ***provide social-emotional*** *and* ***cognitive growth-fostering situations****.*

Notes

Date:
Length of Visit:

VIII. Session 5: Review

4-6 weeks

- Review the previous weeks' content on *Feeding is More than Just Eating* by asking the parent questions like:
Did you talk and smile more to your baby during feedings this week?
Did that knowledge about feeding and playing help you in any way?
Was it easier to understand/help your baby?
-It may be helpful to review last weeks Key Idea sheet.
-Review learning from last week and all previous weeks. Skim through pamphlets and Key Idea sheets, emphasizing all that mother has learned. Say something like:
"Wow, not only did you get used to being a mom over the last month, but you learned all this stuff!"
-Ask mother if she has any questions about anything learned over the last weeks.
-Thank her very much for her participation.

IX. Weekly Key Idea Sheets[4]

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[4] Print these out on some interesting paper, not just white or solid coloured paper. Mothers will be more likely to put the key idea sheets somewhere prominent if they are printed on attractive paper.

Week One

This week--notice when your baby is in the ***Quiet Alert*** state. This is when

- your baby's eyes are wide and bright
- your baby will focus on your face, voice, or moving objects
- your baby is ready to be with you
- you can play with your baby!

When your baby is quiet and alert

- try talking gently to your baby
- give your baby something to see, hear, or suck to keep your baby in the quiet alert state.
- go slow, and allow your baby to rest and look away when your baby wants.

Wow! You are playing together!

Week Two

This week--when your baby is in the ***Quiet Alert*** state, try and get your baby to

- follow your face
- follow a toy
- turn to your voice
- turn to a rattle or bell.

This will be fun!

Watch for your baby's smiles. Whenever your baby smiles

- smile back
- talk
- kiss and cuddle your baby
- show your delight.

Soon, your baby will smile back at you!

Week Three

This week--watch to see your baby's ***Engaging Cues*** that mean your baby wants to be with you. What are they?

•Easy to See

____

•Hard to See

____

What are your baby's ***Disengaging Cues*** that mean your baby needs a break?

•Easy to See

____

•Hard to See

____

What did you do when you saw these cues?

Week Four

This week--during ***feedings***, try to:

- position your baby so you can see your baby's face and eyes
- respond to your baby's movements or sounds (remember state modulation!)
- praise and say positive things to your baby
- let your baby play with your finger, clothing, or a toy during the feeding
- talk about things other than the feeding, e.g. tell stories, talk about your feelings or what you are going to do that day
- let your baby know what you are going to do before you do it.

You can do all this during ***play time*** too!

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Appendix H

Recruitment Strategies

Nurse Researcher Actions

- Persistence and patience
  Go to the postpartum unit daily to check the census for admissions and deliveries. Check Labour & Delivery for impending births.
- Establish a relationship as early as possible in hospital
  Talk to any teenager who is admitted antepartally. Visit the teenagers briefly each time on readmission. Call mothers by name. The first contact is the best person to do the intervention if a relationship is to be established.
- Sensitivity
  Keep visits brief, following the cues of the teen; stay longer and provide more information if it seems to be desired.
- Genuine interest
  Ask "How was your delivery?", "Did you have a boy or girl?"
- Time to establish rapport
  Being unhurried is essential!
- Include significant others
  Ask "How does it feel to be a father?" or say "Nice to meet you, you must be a proud dad!"
- Availability
  "Provide your name and contact number for questions and indicate that you will try and visit her before she goes home.
- Be personable
  Wish mothers luck for a good delivery. Compliment mother or baby on appearance.
- Helpfulness
  Help filling in forms or with latching on during breastfeeding.
- Be knowledgeable
  Coming across as an expert in breastfeeding, soothing, or diaper changing helps! Volunteering information about your education and job experience helps too.
- Establish trust
  Encourage the mothers to speak to their significant others before making their decision to participate or not.
- Use humour
  In describing the home visitor, say "Here I am, what you see is what you get!"
- Use common language
  Talk about programs rather than experimental or control groups.
- Be informative
  Carefully go through consent form/information letter and answer all questions.

Study Description

- Be positive
  Emphasize that the programs are designed to make parenting easier and that mothers will receive free nursing visits and telephone calls.
- Normalize the situation
  Tell mothers that everyone who delivers a baby who is under 20 years of age has an opportunity to get involved in the programs. Also allude to other mothers who "just joined".
- Emphasize flexibility
  Tell mothers that the visits are on their schedule.
- Emphasize convenience
  Point out that transportation to and from the hospital will be provided for the follow-up assessments. Car seats will be available for their babies if needed during transport.
- Emphasize service component
  Tell mothers a nurse will check the babies' development and that she can tell them some things to try with their babies. Also refer again to the free home visits and telephone calls.
- Talk about risks
  Tell the truth!

Appendix I

Retention Strategies

- Encourage "speedy" decision

  Impress upon the teenager (and significant other) the need to decide within a couple of days, because you need to visit them in first week to address questions and concerns they will have. [Reducing the delay between the birth and the first weekly home visit may also reduce attrition for an imminently practical reason. Due to time constraints and the stresses associated with new motherhood, it was always difficult to conduct the home visit in the first week postpartum. Stressing the importance of visiting earlier in the week would facilitate making appointments earlier in the week and if the visit is cancelled, improves the probability for a second appointment (or third) being kept. This requires that mothers will need to make the decision to participate sooner, so a recommendation is that mothers be asked to decide by the end of their first day home from hospital, and a visit ought to be made the next day if possible.]
- Gather contact numbers

  At least three telephone numbers are essential to maintain contact in case of telephone service interruption.
- Make appointments early

  Make appointments with mothers for next visits while visiting with them. Tell mothers to call you if any problems arise that will cause problems for attendance.
- Confirm, confirm, confirm

  Always telephone the mothers to confirm your appointment prior to travelling to their homes. Frequently, the mother may inform you that the scheduled time is not opportune after all. (Do not assume that the mothers will call you and let you know!)
- Plan visits early.

  Plan visits early in the scheduled week, so if a visit is cancelled, you will have several days in which to reschedule.
- Reschedule, reschedule, reschedule

  It may be difficult to visit some families during the week allotted due to adolescents' busy motherhood schedules. You may have to reschedule several times. When mothers cannot meet at the scheduled time, press to reschedule as soon as possible--visit later in the day if time is available.
- Persistence is the key

  If a mother is unable to settle on a new appointment time, ask if you can call her later that day or early in the next day to see if she is available then. You may need to repeat this several times before you can find a time when the mother will agree to be visited.
- Remind, remind, remind

  Call mothers to remind them about the upcoming follow-up assessments several times.

- Listening
  Whenever you call or visit, take ample time to listen to mothers' concerns.
- Provide support
  Address mothers' concerns in a timely manner. Answer questions during visits or call back shortly after visits with answers.
- Thoughtfulness.
  The gift of the one-month baby birthday cards was well received.
- Emphasize importance of follow-up assessments
  It will be an opportunity to see their nurse again. Emphasize that you look forward to seeing the mothers at the follow-up assessments.
- Describe what will happen during the follow-up assessments
  Say something like "Now that we have learned all this stuff (together/about interacting with your baby), we want to see how well you two are doing together and which program worked best." Prepare mothers for being videotaped.
- Provide transportation
- Provide a comfortable atmosphere for follow-up visits
  Make sure seating is comfortable, refreshments are provided, and significant others are welcomed.
- Say Thanks!
  Thank mothers for participating at every stage.

Appendix J

Visual Expectation Paradigm Test: Instrumentation and Data Reduction

Test Equipment

Emerson Television (40 cm x 30 cm)
Panasonic Color Videomonitor (20 cm x 27 cm)
Emerson VCR
JVC Professional VCR
Panasonic VHS videocamera
TV/VCR stand 61cm wide x 80 cm high x 46 cm deep)
4-piece blind/videocamera support mechanism
Tripod
Eye stimulus videotape (obtained from Jacobson et al., 1992 then audio signals were edited on to tape that corresponded with the visual stimuli)
Blank subject videotape
Table (74cm high)
Cosco Infant Day Cradle (75 degree tilt)
Metre stick

Test Procedure

The VEXP test procedure was pretested on 7 infants prior to full scale testing of the pilot sample. Once the infants were determined to be in the quiet alert state, the testing procedure began. Infants reclined in the infant day cradle situated on top of the table. The TV and Panasonic VCR were on the stand, as was the blind supporting the Panasonic videocamera. The stand was pulled toward the infant until the infants' eyes were 55 cm away from the centre of the TV screen. The "audio out" port of the Panasonic VCR was plugged in to "audio in" of the Professional VCR. The "video out" port of the Panasonic videocamera was fed to the "video in" of the Professional VCR. The "audio out" and "video out" ports of the Professional VCR was plugged in to the "audio in" and "video in" ports of the videomonitor. (As a result, the videotaping was conducted by the Professional VCR that was fed the video and silent audio portions of the session. The videomonitor was used to check the video and audio quality. The blank subject tape was in the Professional VCR.) The stimulus tape was cued in the Emerson VCR and everything was powered "on". While viewing the videomonitor, the focus of the videocamera was adjusted and the infant was repositioned. The parent was also able to view her infant's responses on the videomonitor. "Record" was pressed on the Professional VCR. Then play was pressed on the Emerson VCR to activate the stimulus tape. The screen was tapped with a metre stick to reorient the infant whenever distracted during the 3-minute test.

Data Reduction Equipment

JVC BR-S525U Videocassette Player (with variable tracking)
Panasonic Videomonitor (20 cm x 27 cm)

JVC Editing Control Unit RM-G870U
Standard headphones

Data Reduction Procedures

The VEXP data reduction equipment was pretested on 7 infants for feasibility before full scale testing of the pilot sample. After the pretest data were examined and determined to be suitable for analysis, it was deemed acceptable to proceed with the pilot testing.

On play back of the pilot sample data with the above data reduction equipment, it was observed that the first frame on which the stimuli picture appeared did not exactly correspond to the onset of the audio signal. This was due to the equipment used to edit the sounds on to the stimuli video which was accurate to ±1 frame. The pictures started after the sounds, on average about 1.71 ± 0.61 frames. This average delay was accounted for in all data files, i.e. the sound started 1.71 frames before the visual stimuli, so the 1.71 was subtracted from the calculation of reaction times (RT's).

Data coders recorded the frame of audio signal onset and the frame of anticipatory or reactionary eye movements. If the eye movement was on-task (in the correct direction), then the coders recorded the frame of the audio signal terminus. (See sample data reduction form at end of appendix.) On examination of the stimulus tape, it was determined that the average length of the stimulus sounds was 20.75 frames. As a result, I counted as reactions all those eye movements that occurred up to 21 frames inclusive after the stimulus sounds started. The 1000 ms interstimulus interval (approximately 30 frames in length) was determined to occur at 22+ frames post stimulus onset.

The traditional technique for determining reactions had the coder advance the videotape to the stimulus onset frame, and if the infant was oriented in the correct direction, then to rewind frame by frame until eye movement occurred. The equipment I used did not permit rewinding as this induced frame "slippage" or stretching of the videotape. As a result, coders had to record all eye movements as they occurred and to code one tape from start to finish in one sitting. Frame slippage was examined by analyzing the difference in two separate codings of one tape. The results revealed that there was a .73 frame difference on average (1.46 standard deviation) between codings of stimuli start times. As well, having to sit for 3 to 4 hours to code one tape in entirety may have introduced fatigue effects into the data analysis.

All data were entered in to spreadsheets for analysis. Following analysis, the results were then imported in to a statistical package for combination with the remaining data set. Originators of the technique calculated ***baseline reaction times***, as well as the ***postbaseline median reaction times***, ***percent anticipations*** (≤ 200 ms after stimulus onset, ***percent fast reaction times*** (201-301 ms after stimulus onset), ***and percent slow reaction times*** (>450 ms after stimulus onset). In the pilot data set, there was inadequate data in the baseline sequences to warrant the calculations of baseline reaction times. As well, no theoretical rationale for the calculation of the percent slow reaction times was apparent. Manuscript Two provides the details of the resultant analyses of the pilot data.

Possible Changes to Instrumentation

The reliability data (reported in Manuscript Two) suggest difficulties with the subjective nature of coding the videotaped infants' reactions to stimuli. As a result, modifications to the VEXP technique were suggested.

Test error will likely be corrected through the introduction of more sophisticated equipment. The pilot study utilized a standard 1 lux video camera for videotaping the infants reactions to the TV stimuli. Occasionally the data coders reported difficulty viewing the infants eyes due to shadow. It is expected that a lower lux camera could provide more usable data for analysis. In addition, as was done in the original studies conducted by Haith and colleagues (Dougherty & Haith, 1997; Haith, Hazan, & Goodman, 1988; Haith & McCarty, 1990), a permanent time code needs to be placed on the videotaped data. This will eliminate problems with slippage of frames on playback of the videotaped data. The coding equipment induced slippage of frames on playback of the videotaped data in the backwards direction. As a result, it was difficult to review sequences in the backwards motion and coders were discouraged from double checking the accuracy of their observations of reactions. As well, split screen technology where the stimuli pictures appear on one side and the infants' reactions appear on the other, may be reintroduced to promote reliable assessments of reactions in real time. This technology would require the assistance of professional audio-visual videorecording equipment and professional assistance, likely available in studio settings.

Another possible method of reducing error is to have two coders independently code all of the data. Once coded, only those stimuli that have independent agreement would be entered into the analysis of reaction times (RT's). As discussed earlier, this was a method used to assess reliability and it proved quite effective. Recall that the mean differences in coders assessment of RT's, once the disagreements about whether or not a reaction occurred in response to particular stimuli were eliminated, were quite reliable. The mean difference between coders tabulation of RT's was quite minimal (0.52 to 2.70 frames). See page 52 of text for details.

Another possible solution, in the effort to reduce human error is to eliminate human interpretation through the use of computer image analysis. Videotaped data can be digitized with available PC hardware and software. By importing the digitized images into imaging software, the position of the infants facial midline and pupil position can be entered as coordinates on the plane of the screen. Using the distance between the pupil position and facial midline as a measure of visual reaction, a numerical criterion can be defined for reaction. Coding the data digitally with such a reaction criterion eliminates the error introduced by rater perception. However, there is a risk in reducing human reactions to a set of numeric criteria. Computers can be insensitive to the subtleties of human movements as compared to experienced raters. As a result, this method of coding can reduce variability in data but contains the risk of providing a measure somewhat unrelated to reaction.

Table J-1

VEXP Sample Form

Visual Expectation Paradigm (VEXP)Test

Subject Number **Testing Date**

Abbreviations

EM-eye movement.
FTT-Failed to track.
LAO-Looking away at onset of the stimulus.
D-Disagreement
L-Looking
O-Onset
(R)-Right
(L)-Left

Units of Measurement

30 frames/second
33 milliseconds/frame
1000 milliseconds/1 second

Stimulus Start

First frame on which sound heard clearly.

Stimulus Presentation

Left is infant's left
Right is infant's right

Stimulus End

Last frame on which sound heard.

Baseline Series (11 pictures)

Stimulus	Stimulus Start (Frame Count)	Reaction Time (frame count on which infant's eye begins to move toward stimulus) / Comments	Stimulus End (Frame Count)
Right			
Right			
Left			
Left			
Left			
Right			
Right			
Left			
Left			
Right			
Left			

Regular Series (80 pictures)

Right			
Left			
Right			
Left			
Right			
Left			

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